Analysis of Labour Productivity in Selected Nifty 50 Companies

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Abstract

Research Issue:Productivity represents the relationship ratio of output and input. It reflects how efficiently resources are being used in creating outputs.The present study aims to measure labour productivity in selected Nifty 50 companies.Labour productivity is the ratio of output to the labour input. Therefore, an attempt has been made to analyse and interpret thelabour productivity from 2010-11 to 2017-18 i.e. for eight years in selected 24 companies included in Nifty 50.

Research Findings:For intra-company comparison non parametric chi-square test has been used and results indicated that the null hypothesis drawn is acceptedindicates that the labour productivity indicesof the company for the study period are approximately equal and can be represented by straight line trend or line of best fit.For inter-company comparison Kruskal Wallis One Way Analysis of Variance Test has been used and results indicated that null hypothesis isrejected in all the sectors representsthe significant difference in the labour productivity ratios of the companies.

Conclusion and Suggestions:On analysing the labour productivity of all companies during all the years under study, it has been observed that overall labour productivity is the best in Reliance Industries Ltd., followed by Hindustan Petroleum Corporation Ltd. and Bharat Petroleum Corporation Ltd. Possible savings has also been calculated and result indicated that the total possible savings in labour input of Tata Consultancy Ltd. would have been as high as   30793 crore while it would have been as low as   552 crore of Vedanta Ltd. during the study period of eight years. Theyear of lowest labour input output ratio has been taken as the base yearfor calculating possible savings. Furtherit has been suggested that labour productivity can be improved by optimally utilizing the labour cost. To improve the labour productivity a company can adopt the measures such as quality circles, management by objective, employee's flexitime technique of work, incentives schemes to the workers attaining the target, etc.

Keywords: LabourProductivity, Index Number, Output, Labour Input, Chi-Square Test, Kruskal Wallis One Way Analysis of Variance Test, Possible Savings.

Introduction

Productivity is regarded as an essential source of growth in an economy. A country having a productive economy has comparatively

high ratio of surplus to capital, high level of labour productivity, low level of labour input output ratio and high level of profit rate. Thus productivity determines the efficiency and effectiveness of the companies factors of production. It represents the relationship ratio of output and input.It reflects how efficiently resources are being used in creating outputs.

As quoted by Maheshwari and Taparia, in the words of B. B. Lal,"Productivity is a measurable relationship between well-defined outputs and inputs, i.e., between the production results and the relative production agents in both the financial and physical terms in relation to given terms and conditions."

Measurement of productivity comprises of various inputs viz., material, labour, overhead and investor input. Labour isconsidered as an essential factor in production aswithout it otherfactors will remain idle. Labour productivity is the ratio of revalued output to the revalued labour input. Labour Productivity can be denoted as

Labour Productivity = Total Output

 Labour Input

Hence, this study aims to measure labour productivity in selected companies of Nifty 50.

Review of Literature

Many studies related to productivity at national and international level have been carried out over the last few decades. Few studies are being summarised below:

Ferreira and Martinez (2011) focused on the employees perceptions of productivity or company investments in respect of intellectual capital. The Bontis model of intellectual capital has been adopted. As per the model, intellectual capital has been categorised into three components, viz. human capital referring to knowledge and skills of the individual,structured capital comprising internal processes and information of organisation and customer relational capital which refers to the inter relationship of organisation and its stakeholders. The data were obtained from the survey conducted on 440 employees of 13 Portuguese companies. The statistical tools and techniques adopted in the study were ANOVA and regression analysis. It has been concluded by the results that the companies with higher structured capital have a lower perception of in human resources while higher perception of investment in marketing and sale and also higher perception of productivity.

Manonmani (2012)highlighted that the wage-productivity relationship in Indian industries has been ongoing and indecisive issue. The studytherefore, highlights the wage productivity linkages in rural, urban and aggregate industries of India covering the periods from 1998-1999 to 2007-2008. The regression model has been used to understand the links between wages and productivity. The study computed the partial as well as total factor productivity indices. The variables used in the study are output and input. NVA (Net Value Added) has been used as output. Input includes labour and capital element where labour consists of workers directly or indirectly involved in production while capital consists of invested capital.

Taparia and Maheshwari (2015)reviewed in their study the literature related to productivity. According to the study, there are many studies available at international, national and regional level related to productivity. The study reviewed the selected literature from the year 1975 till the end of the year 2015. The study concluded that the methodology employed, nature of data used, number of variables examined, estimation procedure adopted, conclusion drawn vary widely with respect of time.

Maheshwari and Taparia (2019)analysed the material productivity of pharmaceutical sector companies from 2008-09 to 2015-16. Both intra sector and inter sector comparison has been drawn and for intra-sector hypothesis, Chi-Square Test has been used and for inter-sector hypothesis, Kruskal Wallis One Way Analysisof Variance Test has been used.

Research Gap: As per the above reviewsand many more studies studied related to the topic, there is no study onlabour productivity inselectedNifty 50 companies for this particular study period has been conducted. So in this present research an attempt has been made to measure thelabour productivityof selected companies.

Research Methodology

Main Objectives of the Research

The main objectives are being summarized as follows:-

1)To analyse and interpret the labour productivity of the selected companies included in Nifty 50.

2)To make intra-company and inter-company comparison of labour productivityof the sampled companies for the study period.

3)To recommend ways for the improvement in labour productivity.

Sample and Collection of Data

The study is based on the secondary data extracted from a sample of 24 companies has been selected from the Nifty 50. These companies have been selected from Automobile, Energy, Information Technology, Metals, Pharmaceutical

and Refineriessector which has a great impact on the economy of country.

The data and information regarding output (includes sales, other income and change in the inventory of finished goods, work in progress and traded goods), labour input(includes salary, wages, bonus and benefits, contribution to provident and other funds and employees welfare expenses and others) and all other financial variables have been obtained from the annual reports of theselectedcompanies.The index numbersused in the study have been collected from the various bulletins published by Reserve Bank of India on its website.

Model to be used

Productivity Accounting Model is being used for measuring productivity as it considers all the elements of output and input, ignoring the effect of inflation. But here in the present research, only one element of input i.e. labour is considered and analysed.

Selection of Base Year

The study covers a period of eight years i.e. from 2010-11 to 2017-18. The year 2010-11 has been taken as the base year which is used for the revaluation of output as well as of labour input.

Research Hypotheses and Testing

In accordance with the objectives of the research, following hypotheses have been developed which will be tested.

Intra Company Hypothesis:It is tested with the help of Non

Parametric Test "Chi-Square Test".

Null Hypothesis (H0): There is no significant difference in the labour productivity indices of the sampled company for the study period and can be represented by straight line trend or line of best fit.

The acceptance of null hypothesis would reveal that the labour productivity indices of the sampled company for the study period are approximately equal.

Inter Company Hypothesis:It is tested with the help of Kruskal Wallis One Way Analysis of Variance Test.

Null Hypothesis (H0): There is no significant difference in the labour productivity ratios for the sampled companies.

The acceptance of null hypothesis would reveal that the labour productivity ratios of sampled companies are approximately equal.

Calculation of Index Numbers and Conversion Factors

To remove the inflation effect in the data, index numbers published by various RBI Bulletins and conversion factorscalculated accordingly have been used,forthe revaluation of data on the base year's prices for eight years from 2010-11 to 2017-18.Here the year 2010-11 has been taken as base year andBackward Splicing technique has been used for calculating the index numbers of 2010-11.

Following formula has been used to calculate conversion factors:

Index number of the base year

Index number for the current year

Table 1 : Index Numbers and the Conversion Factors for Revaluation of Data

Year	Wholesale Price Index Base year 2011-12 = 100	Conversion Factors	Consumer Price Index for Industrial Workers Base Year 2001 = 100	Conversion Factors
2010-11	91.80	1.000	180.00	1.000
2011-12	100.00	0.918	195.00	0.923
2012-13	106.90	0.859	215.00	0.837
2013-14	112.50	0.816	236.00	0.763
2014-15	113.90	0.806	251.00	0.717
2015-16	109.70	0.837	265.00	0.679
2016-17	111.60	0.823	276.00	0.652
2017-18	114.90	0.799	284.00	0.634

Source: Author's Calculation with the help of RBI Bulletin

Revaluation of Output

The output of the companies has been revalued by multiplying the output values with the conversion factors. Output includes sales, other income and change in the inventories of finished goods, work in progress and traded goods. Wholesale price index has been used for revaluating the output.

Revaluation of labour Input

The labour input of the companies has been revalued by multiplying the input values with the conversion factors.

Here for the purpose of this study, the labour input includes salary, wages, bonus and benefits, contribution to provident and other funds and employees' welfare expenses and others and it is revalued with the consumer price index for industrial workers.

Labour Productivity Analysis

A comparative labour productivity analysis has been drawn and alsoits average performance for the study period has been evaluated. Table 2 shows that the labour productivity as well as its average overall labour productivity.

Table 2: Labour Productivity Ratios from 2010-11 to 2017-18

Years	2010-11		2011-12		2012-13		2013-14		2014-15		2015-16		2016-17		2017-18		Overall	
Companies	Labour Productivity	Rank	Labour Productivity	Rank	Labour Productivity	Rank	Labour Productivity	Rank	Labour Productivity	Rank	Labour Productivity	Rank	Labour Productivity	Rank	Labour Productivity	Rank	Average	Rank
Bajaj Auto Ltd.	34.2233	8	36.9079	7	33.4079	8	30.6703	9	27.7330	9	31.7614	9	41.5492	8	31.2639	8	33.4396	9
Mahindra & Mahindra Ltd.	16.5504	13	18.5395	13	22.4960	10	20.2413	12	19.2216	13	21.8545	13	21.1384	13	22.1437	13	20.2732	12
Maruti Suzuki India Ltd.	52.6879	5	42.7662	6	42.6247	6	34.8191	8	35.2270	8	36.0846	8	37.8815	9	36.4000	7	39.8114	7
Tata Motors Ltd.	20.5566	12	20.0497	12	16.8974	12	14.3055	14	13.5647	14	18.1338	14	15.1046	14	19.4535	14	17.2582	14
GAIL (India) Ltd.	45.5399	7	66.0328	5	63.0185	4	72.8924	5	71.7277	4	65.8182	5	49.5535	5	52.8852	6	60.9335	5
NTPC Ltd.	20.5782	11	20.8639	11	21.0062	11	20.6560	11	23.3901	11	24.4864	12	23.1585	12	22.6803	12	22.1025	11
Oil and Natural Gas Corporation Ltd.	10.6615	17	11.8361	16	8.7843	18	9.3232	18	11.4720	15	11.9273	16	9.3381	17	10.2787	16	10.4527	16
Power Grid Corporation of India Ltd.	12.1985	16	12.7248	15	15.4322	13	17.8547	13	19.5253	12	26.7538	10	24.3601	11	24.1444	10	19.1242	13
Infosys Ltd.	2.1295	24	2.1576	24	2.0113	24	2.0606	24	2.2665	24	2.4907	24	2.5434	24	2.5599	23	2.2775	24
Tata Consultancy Services Ltd.	2.9215	21	2.9303	21	3.0435	21	3.3772	21	3.2056	21	3.6735	21	2.5515	23	2.5245	24	3.0284	22
Tech Mahindra Ltd.	2.6197	22	2.3465	23	2.4115	22	2.5105	22	3.0108	22	3.6728	22	3.9213	21	3.9475	21	3.0551	21
Wipro Ltd.	2.4640	23	2.4623	22	2.2284	23	2.3544	23	2.4763	23	2.7331	23	2.8219	22	2.7369	22	2.5347	23
Coal India Ltd.	21.7969	10	30.6853	9	33.8666	7	49.3431	7	44.5024	7	55.8895	7	46.7034	6	23.9493	11	38.3420	8
Hindalco Ltd.	22.8876	9	23.9458	10	23.2196	9	22.4834	10	25.0890	10	25.8258	11	26.5416	10	28.8193	9	24.8515	10
Tata Steel Ltd.	10.4851	18	11.2927	17	11.0247	16	12.3288	15	10.1745	17	12.0405	15	14.3480	15	16.1362	15	12.2288	15
Vedanta Ltd.	53.6366	4	36.0985	8	13.8075	14	56.9981	6	60.1290	6	79.1786	3	73.9829	2	77.5935	4	56.4281	6
Cipla Ltd.	13.5893	15	9.7477	18	8.6196	19	7.9109	20	7.4146	19	8.6247	18	8.1481	18	8.1627	18	9.0271	19
Dr. Reddy's Laboratories Ltd.	7.6228	20	7.7131	20	7.6424	20	8.7630	19	7.6944	18	7.5142	19	7.2188	19	6.5041	20	7.5841	20
Lupin Ltd.	9.1830	19	8.9937	19	10.0219	17	11.7527	16	10.4262	16	11.6917	17	11.3866	16	9.0075	17	10.3079	17
Sun Pharmaceutical Industries Ltd.	15.4173	14	13.4367	14	11.6134	15	11.3729	17	6.4626	20	6.6424	20	6.8508	20	7.1944	19	9.8738	18
Bharat Petroleum Corporation Ltd.	53.9608	3	93.7251	3	89.0764	2	95.8187	3	131.9461	1	82.2239	2	73.3313	3	88.0252	2	88.5134	3
Hindustan Petroleum Corporation Ltd.	66.3039	2	112.1660	2	84.7803	3	117.8191	2	98.7332	3	96.3384	1	78.8724	1	97.8685	1	94.1102	2
Indian Oil Corporation Ltd.	50.7422	6	86.8461	4	62.8635	5	76.8250	4	71.1816	5	57.5353	6	45.3121	7	53.7365	5	63.1303	4
Reliance Industries Ltd.	94.4979	1	116.4948	1	111.6790	1	126.7694	1	103.6113	2	70.8687	4	70.0013	4	78.4414	3	96.5455	1

According to the above table, labour productivity is the best in Reliance Industries Ltd., followed by Hindustan Petroleum Corporation Ltd. and Bharat Petroleum Corporation Ltd. in 2010-11, 2011-12 and 2013-14. It is the best in Reliance Industries Ltd., followed by Bharat Petroleum Corporation Ltd. and Hindustan Petroleum Corporation Ltd. in 2012-13. It is the best in Bharat Petroleum Corporation Ltd., followed by Reliance Industries Ltd. and Hindustan Petroleum Corporation Ltd. in 2014-15. It is the best of Hindustan Petroleum Corporation Ltd., followed by Bharat Petroleum Corporation Ltd. and Vedanta Ltd. in 2015-16 while in 2016-17 Hindustan Petroleum Corporation Ltd. has the highest productivity followed by Vedanta Ltd. and Bharat Petroleum Corporation Ltd., in 2017-18 Hindustan Petroleum Corporation Ltd. has the highest productivity followed by Bharat Petroleum Corporation Ltd. and Reliance Industries Ltd.

By analysing the overall labour productivity of all

companies during all the years under study, it has been observed that overall labour productivity is the best in Reliance Industries Ltd., followed by Hindustan Petroleum Corporation Ltd. and Bharat Petroleum Corporation Ltd.

Intra-company comparison of Labour Productivity

Intra-company comparison of labour productivity of the selected companies of six sectors of Nifty 50 has been calculated and tested with the help of Chi square test and results has been shown in table 3.

Table 3: Intra-Company Comparison of Labour Productivity of Companies from 2010-11 to 2017-18 through Chi-Square Test

S. No.	Company Name	Chi Square Value	Hypothesis Testing
1	Bajaj Auto Ltd.	11.041	Null Hypothesis is Accepted
2	Mahindra & Mahindra Ltd.	4.749	Null Hypothesis is Accepted
3	Maruti Suzuki India Ltd.	5.068	Null Hypothesis is Accepted
4	Tata Motors Ltd.	13.193	Null Hypothesis is Accepted
5	GAIL (India) Ltd.	26.646	Null Hypothesis is Rejected
6	NTPC Ltd.	1.443	Null Hypothesis is Accepted
7	Oil and Natural Gas Corporation Ltd.	9.346	Null Hypothesis is Accepted
8	Power Grid Corporation of India Ltd.	10.289	Null Hypothesis is Accepted
9	Infosys Ltd.	1.972	Null Hypothesis is Accepted
10	Tata Consultancy Services Ltd.	11.706	Null Hypothesis is Accepted
11	Tech Mahindra Ltd.	8.528	Null Hypothesis is Accepted
12	Wipro Ltd.	2.177	Null Hypothesis is Accepted
13	Coal India Ltd.	107.206	Null Hypothesis is Rejected
14	Hindalco Ltd.	1.324	Null Hypothesis is Accepted
15	Tata Steel Ltd.	8.106	Null Hypothesis is Accepted
16	Vedanta Ltd.	72.090	Null Hypothesis is Rejected
17	Cipla Ltd.	10.719	Null Hypothesis is Accepted
18	Dr. Reddy's laboratories Ltd.	3.294	Null Hypothesis is Accepted
19	Lupin Ltd.	9.013	Null Hypothesis is Accepted
20	Sun Pharmaceutical Industries Ltd.	12.135	Null Hypothesis is Accepted
21	Bharat Petroleum Corporation Ltd.	69.482	Null Hypothesis is Rejected
22	Hindustan Petroleum Corporation Ltd.	32.335	Null Hypothesis is Rejected
23	Indian Oil Corporation Ltd.	33.676	Null Hypothesis is Rejected
24	Reliance Industries Ltd.	19.682	Null Hypothesis is Rejected

If the calculated value of chi square is less as compared to the table value 14.067 at 5% level of significance with (8-1) = 7 degree of freedom, null hypothesis is accepted. This reveals that the labour productivity indicesof the company for the study period are approximately equal and can be represented by straight line trend or line of best fit.

If the calculated value of chi square is more as compared to the table value, null hypothesis is rejected. This reveals that the labour productivity indices of the company for the study period are not equal and cannot be represented by straight line trend or line of best fit.

Inter-company comparison of Labour Productivity

For inter-company comparison, Kruskal Wallis One Way Analysis of Variance Test has been used. According to which the labour productivity of all the samples is combined and arranged in order of increasing size and given a rank number and H Value is calculated as shown in table 4.

Table 4: Inter-Company Comparison of Labour Productivity Ratios

S. No.	Sector Name	H Value	Hypothesis Testing
1	Automobile Sector	25.912	Null Hypothesis is Rejected
2	Energy Sector	26.466	Null Hypothesis is Rejected
3	Information Technology Sector	13.935	Null Hypothesis is Rejected
4	Metals Sector	21.872	Null Hypothesis is Rejected
5	Pharmaceutical Sector	9.281	Null Hypothesis is Rejected
6	Refineries Sector	11.514	Null Hypothesis is Rejected

The calculated value is greater than the table value 7.815at 5% level of significance with (4-1) = 3 degreesof freedom for all the companieshence null hypothesis isrejected. This means that the labour productivity ratios of the companies included in Nifty 50 are not same that is there is significance difference in the labour productivity ratios.

Possible Savings in Labour Input

Possible savings in labour input has been calculated to analyse what would have been saved if the labour input is optimally utilized. To view the performance of the companies in respect of the labour input an attempt has been made to calculate the possible savings.

The possible savings in labour input can be calculated on the basis of following formula:

Possible Saving in Labour Input = Actual labour input – Standard labour input

Standard Labour Input = minimum requirement of labour input per unit of output X Actual Output revalued according to the base year

Actual labour input means the actual revalued labour input according to base year prices

Table 5: Possible Savings in Labour Input from 2010-11 to 2017-18

Years Companies	2010-11 Savings	2011-12 Savings	2012-13 Savings	2013-14 Savings	2014-15 Savings	2015-16 Savings	2016-17 Savings	2017-18 Savings	Overall Savings
Bajaj Auto Ltd.	87	56	104	144	213	147	0	167	918
Mahindra & Mahindra Ltd.	378	275	0	164	240	43	105	26	1232
Maruti Suzuki India Ltd.	0	146	170	353	381	424	426	554	2455
Tata Motors Ltd.	0	63	425	669	756	244	652	137	2947
GAIL (India) Ltd.	271	54	89	0	11	66	263	227	982
NTPC Ltd.	448	425	402	464	119	0	156	224	2237
Oil and Natural Gas Corporation Ltd.	717	51	2281	1736	239	0	1638	1001	7664
Power Grid Corporation of India Ltd.	406	408	314	239	198	0	80	99	1743
Infosys Ltd.	2096	2246	3576	3625	2065	519	131	0	14259
Tata Consultancy Services Ltd.	2086	2634	2453	1322	2500	0	9584	10214	30793
Tech Mahindra Ltd.	654	843	819	1936	1225	350	34	0	5862
Wipro Ltd.	1386	1565	2799	2317	1731	456	0	414	10669
Coal India Ltd.	153	128	114	32	54	0	44	190	716
Hindalco Ltd.	214	174	195	226	148	120	90	0	1166
Tata Steel Ltd.	992	844	954	661	1219	745	332	0	5746
Vedanta Ltd.	48	97	128	121	113	0	34	11	552
Cipla Ltd.	0	190	296	409	491	444	451	452	2732
Dr. Reddy's Laboratories Ltd.	91	95	122	0	131	166	208	301	1113
Lupin Ltd.	107	125	88	0	85	4	29	213	651
Sun Pharmaceutical Industries Ltd.	0	37	49	56	619	572	543	547	2422
Bharat Petroleum Corporation Ltd.	1654	600	749	601	0	733	990	720	6047
Hindustan Petroleum Corporation Ltd.	865	68	591	0	278	285	633	304	3024
Indian Oil Corporation Ltd.	2681	0	1686	588	924	1755	3035	2441	13110
Reliance Industries Ltd.	665	211	330	0	480	1274	1292	1143	5394

Table 5 suggests that the total possible savings in labour input of Tata Consultancy Ltd. would have been as high as 30793 crore while it would have been as low as 552 crore of Vedanta Ltd. during the study period of eight years. For calculating possible savings year of the lowest labour input output ratio has been taken as the base year.

Conclusion and Suggestions:On analysing the labour productivity of all companies during all the years under study, it has been observed that overall labour productivity is the best in Reliance Industries Ltd., followed by Hindustan Petroleum Corporation Ltd. and Bharat Petroleum Corporation Ltd. Although it is suggested that labour productivity of a company can be improved by utilizing its labour cost optimally with reduction in idle labour hours. To improve the labour productivity a company can adopt the measures such as quality circles, management by objective, employee's flexitime technique of work, incentives schemes to the workers attaining the target, etc. Also a company should promote leisure or recreational activities which are mainly categorized as physical, social, cultural and intellectual activities. These activities include sports, games, vacation, family get together, creating clubs for employees entertainment and encouraging them to join, etc. By adopting the above suggested methods for improving the labour productivity, a company can save the amount of possible savings.

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Acknowledgement