International Journal of Advanced Research and Development
ISSN: 2455-4030
Impact Factor: RJIF 5.24
www.advancedjournal.com
Volume 2; Issue 5; September 2017; Page No. 456-460

Productivity analysis of select steel companies in India

[1] Dr. P Chellasamy, [2] R Selvakumar
[1] Faculty of Commerce, Department of Commerce, Bharathiar University, Coimbatore, Tamil Nadu, India
[2] Ph.D. Research Scholar, Department of Commerce, Bharathiar University, Coimbatore, Tamil Nadu, India

Abstract
India is the world's third-largest producer of crude steel in 2016. The growth in the Indian steel sector has been driven by domestic availability of raw materials such as iron ore and cost-effective labour. Steel is a critical industry in worldwide, and steel products are a heavily traded commodity. In recent years, market changes, shifts in import and export levels, and weakness in the global demand for steel have negatively impacted steel industries across the India. The objectives of the study are examining the productivity efficiency of the steel companies in India. The study used to secondary data in the year of 2006-2007 to 2015-2016. The study found that even though the steel production has been increasing, the companies are not in a position to export more.

Keywords: malmquist productivity index

Introduction
India is the world's third-largest producer of crude steel (up from eighth in 2003) and is expected to become the second-largest producer by 2016. The growth in the Indian steel sector has been driven by domestic availability of raw materials such as iron ore and cost-effective labour. Consequently, the steel sector has been a major contributor to India's manufacturing output. The Indian steel industry is very modern with state-of-the-art steel mills. It has always strived for continuous modernization and up-gradation of older plants and higher energy efficiency levels.

The steel industry in India has been an array of changes in the past decade. The economic scenario which emerged after globalization, privatization and liberalization, has thrown a new challenge before the steel producers. Now it has to be more competitive in order to meet the needs and demands of its steel production. The steel industry sector contributed to increase the awareness of the using steel about the wider range of choice of steel products and the price offered by the competing steels in the market. The technical know-how, expertise and wide experience of multinationals that have joined with the Indian companies have revolutionized almost all aspects in the industry.

Review of Literature
Sarbapriya Ray and Mihir Kumar Pal (2010) where the authors describes study attempts to measure productivity performance in terms of partial factor productivity and total factor productivity growth and tries to relate and adjust economic capacity utilization with total factor productivity growth for the entire period, 1979-1980 to 2003- 2004. The results on partial factor productivity of factors show improvement in productivity of material, labor and capital. The result on the overall productivity shows declining total factor productivity growth during post-reform period as compared to perform period.

Kavitha and Palanivelu (2014) in their study explained that iron and steel industry is important for the economic development of a country in terms of foreign ex-change, employment generation, infrastructure development and technology. This study confines itself to the issues relating to the financial performance of the iron and steel industries with regard to its growth, profitability and liquidity and the impact on various factors such as capital, liquidity passion of iron and steel industry for the period of ten years from 2002 – 2003 to 2001 – 2012.

S.Thenmozhi and K.Tamilselvi (2015) in this study, an attempt was made to ascertain the financial soundness of the selected steel companies. For this purpose, ten years data from the year 2004-2005 to 2013-2014 are taken. The data collected with the help of secondary sources of information. This paper uses the Altman's Z-score model to predict the financial status of selected steel companies in India. The result clearly indicate that the liquidity, working capital turnover efficiency and solvency position of the companies is that the financial health of JSW steel limited, Tata Steel and Mahindra ugine were good and there is no scope of bankruptcy, where as the financial health of other selected companies were not in healthy Zone in many years.

Statement of the Problem
Steel is a critical industry in worldwide, and steel products are a heavily traded commodity. In recent years, market changes, shifts in import and export levels, and weakness in the global demand for steel have negatively impacted steel industries across the India. Along with shifting trade patterns, world benchmark steel prices have been trending downward since early 2011, and the financial outlook for many steel companies has declined. The 2008-2009 global financial crises were particularly difficult for steel industries, and this period will feature prominently in the following discussion of global steel indicators. 2015 was also a period of decline for

the steel industry, as weak global demand caused declines in other indicators.

Objectives of the Study

The objectives of the study are;

- To examine the productivity efficiency of the steel companies in India.

Methodology

Sources of data

The data used for the study are Secondary in nature. The required data were collected from the corporate database (Prowess) of the Centre for Monitoring Indian Economy (CMIE) and other relevant data are collected from moneycontrol.com, journals, magazines, reports and websites.

Period of the study

The study covers a period of 10 years from 2006 – 2007 to 2015 – 2016.

Sampling Design

The sample company are selected on the basis of top 15 companies in purposive sampling based on the market capital have selected.

Frame work of analysis

The Malmquist productivity index is a special mathematical linear programming model and test to assess efficiency and productivity and breaking it down into two components namely, technological change (techch) and technical efficiency change (effch) The malmquist productivity index measures the total factor productivity change (tfpch), between two data points over time, by calculating the ratio of distances of each data points relative to a common technology.[1]

The malmquist productivity change index as can be given as:

$$M_0\,(y^{t+1}, x^{t+1}, y^t, x^t) = \left(\frac{d_o^t\,(x^{t+1}, y^{t+1})}{d_o^t\,(x^t, y^t} \right)$$

$$X = \left(\frac{d_o^t\,(xt+1, yt+1)^{1/2}}{d_o^{t+1}\,(x^t, y^t)} \right) \quad \ldots. (1)$$

The subscript "0" has been introduced to remined us that these are output – oriented measures

The CRS output – oriented Linear programming (LP) used to calculate $d_o^t\,(x^t, y^t)$ is identical to equation (1), except that the convexity (VRS) restriction has been removed and time subscripts have been included. That is,

$$\left[d_o^t\,(x1, yt)^{-1} \right] = \max \qquad \phi, \lambda\ \phi,$$

Subject to

$$-\phi y_{it} + y^t \lambda \geq 0,$$
$$X_{it} - Xt\ \lambda \geq 0,$$
$$\lambda \geq 0,$$

The remaining there LP problems are simple variants of this:

$$\left[d_0\ t+1\ (X^{t+1}, Y^{t+1}) \right]^1 = \max\ \phi, \lambda\ \phi,$$

Subject to

$$-\phi Y_{i,t+1} + Yt\ \lambda \geq 0,$$

$$X_{i,\,t+1} - x_{t+1}\,\lambda\ \geq 0,$$

$$\lambda\ \geq 0, \qquad \ldots. (3)$$

Subject to

$$\left[d_0^t\,(X_{t+1}, Y_{t+1}) \right]^{-1} = \max\ \phi, \lambda\ \phi,$$

$$-\ \phi\, Y_{i,t+1} - Y_{t+1}\,\lambda_t \geq 0,$$

$$\lambda\ \geq 0, \qquad \ldots. (4)$$

$$\left[do^{\,t+1}\,(x_t, y_t) \right]^1 = \max\ \phi, \lambda\ \phi,$$

Subject to

$$-\phi\, y_{it} + Y_t + 1\ \lambda \geq 0,$$

$$X_{it} - x_{\,t+1}\,\lambda \geq 0,$$

$$\lambda \geq 0, \qquad \ldots. (5)$$

The malmquist index of total factor productivity change (tfpch) is the product of technical efficiency change (effch) and technological change (techch) as expressed

tfpch = effch x techch (2)

The malmquist productivity change index, therefore, can be written as:

M0 (Y^{t+1}, X^{t+1}, Y^t, Y^t, X^t) = effch X techch (3)

[1] Neeraj Kumar Singh and Dalip Raina (2015) "Productivity Measurement of Steel Industry in India" Global Journal of Enterprise Information System.

Table 1: Analyses of Labour, Capital and Capital-Labour Ratio of the Steel Companies in India during the period from 2006-2007 to 2015-2016

Year	Labour (L/P) (In Percentages)	Capital (K/P) In Percentages)	Capital-labour (K/L) (In Percentages)
2006-2007	0.155	20.54	21.41
2007-2008	0.167	22.99	23.92
2008-2009	0.209	17.57	18.71
2009-2010	0.164	19.51	19.16
2010-2011	0.207	17.59	18.99
2011-2012	0.179	16.72	17.21
2012-2013	0.150	19.58	19.82
2013-2014	0.128	19.75	16.52
2014-2015	0.132	24.17	22.75
2015-2016	0.077	28.44	26.42
AVG	0.156	20.68	20.49

Source: Annual reports and Journals.

Table 1 depicts the estimated values of labour, capital, capital-labour ratio of select Steel Companies in India period from 2007-2008 to 2015-2016. Despite this declining the Average value of labour ratio was at 0.156 percent. The highest level of labour ratio is 0.209 percent from 2008-2009. The lowest level of labour ratio was at 0.077 percent from 2015-2016 for the entire companies. The increase and decrease the labour ratio depends the investment and savings in physical capital, new technology, and human capital.

The above table presents the capital ratio for the select steel companies for the period 2006-2007 to 2015-2016. At the aggregate level, capital ratio was observed to be the average value was at 20.68 percent for the entire companies. The highest level of capital ratio was at 28.44 percent from the year 2015-2016. The Lowest level of capital ratio was at 16.72 percent.

The above table reveals the capital-labour ratio for the steel companies for the period 2006-2007 to 2015-2016. At the aggregate level, capital ratio was observed to be the average capital-labour ratio for the entire companies was at 20.49 percent for the entire companies. The highest level of capital-labour ratio was at 26.42 percent from the year 2015-2016. The Lowest level of capital ratio was at 16.52 percent. The technological advancements would result in higher investment in the company's leading to more availability of capital per unit of labour.

Partial Factor Productivity

Table 2: Partial Factor Productivity of Steel companies in India during the period from 2006-2007 to 2015-2016

Company Name	LP (Percentage)	KP (Percentage)	K/L (Percentage)
Tata Steel Limited	0.156	0.489	0.194
JSW Steel Limited	0.179	0.287	1.346
Steel Authority of India Ltd	0.057	0.328	0.082
Star Ferro Alloys Limited	0.062	0.309	0.101
VISA Steel	0.137	0.257	0.218
Bhushan Steel	0.192	0.284	0.738
Jindal Saw Steel Limited	0.125	0.693	0.138
Ferro Alloys Corporation Ltd	0.057	0.404	0.144
Usha Martin Limited	0.235	0.293	1.368
Welspun Corporation Limited	0.097	0.302	0.329
Mukand Steel Limited	0.077	0.497	0.174
APL Apollo Limited	0.048	0.264	0.330
Jindal Steel Limited	0.067	0.326	0.512
Ashirwad Steels Industries Ltd	0.059	0.277	0.274
Bajaj Steel Industries Limited	0.046	0.305	0.172
AVG	0.106	0.348	0.408

Source: Annual reports and Journals.

Table 2 reveals the Partial factor productivity values of labour, capital, capital-labour productivity of select steel companies in India period from 2007-2008 to 2015-2016. The total the Average value of labour productivity was at 0.106 percent. The highest level of labour productivity of Usha martin Limited is 0.235 percent. It was majority of the least level of the labour productivity of 7 companies in the out of 15 companies for the study period.

The above table presents the capital productivity for the select steel companies for the period 2006-2007 to 2015-2016. At the aggregate level, capital productivity was observed to be the average value was at 0.348 percent for the select companies. The highest level of capital productivity of Mukand Steel Limited is 0.497 percent from 2015-2016. The Lowest level of capital productivity of VISA Steel limited is 0.257 percent.

The above table shows the capital-labour productivity for the select steel companies in India for the study period 2006-2007 to 2015-2016. The highest level of the capital-labour productivity of Usha martin limited is 1.368 percent. The

lowest level of the capital-labour productivity of star ferro alloys limited was 0.101 percent. A higher level of capital-labour productivity is always preferred as it would increase the labour efficiency.

Analysis of Malmquist Productivity Index

Table 3: Malmquist Productivity Index of select Steel Companies in India during the period from 2006-2007 to 2015-2016

Year	Effch (percentage)	Techch (Percentage)	Tfpch (Percentage)
2006-2007	0.895	0.995	0.891
2007-2008	0.918	1.081	0.992
2008-2009	1.127	1.001	1.128
2009-2010	0.962	1.235	1.188
2010-2011	1.289	0.708	0.913
2011-2012	1.194	1.216	1.452
2012-2013	1.127	0.937	1.056
2013-2014	0.793	1.225	0.971
2014-2015	0.96	1.048	1.006
2015-2016	0.868	1.468	1.274
AVG	1.013	1.091	1.087

Source: Annual reports and Journals.

Table 3 reveals the average of Malmquist Productivity Index is 1.013 percent of efficiency change during the study period from 2006-2007 to 2015-2016. The highest level of efficiency change is 1.194 percent from 2012-2013. The lowest level of efficiency change is 0.868 percent from 2015-2016. Similarly the lowest level of contribution of efficiency change also indicates a point to understand that the factor inputs are yet to be fully utilized and there is labour and capital, in the steel companies.

The above table shows that technological change of average of 1.091 percent period from 2006-2007 to 2015-2016. The highest level of the technological change is 1.468 percent from 2015-2016. The lowest level of the technological change is 0.708 percent from 2010-2011. The greater contribution of technical change in increasing productivity growth indicates that Indian steel companies has undergone technological advancements by way of greater access to capital equipments and raw material and R&D efforts during the period of study.

The above table presents the total factor productivity change in average of 1.087 percent during the study period from 2006-2007 to 2015-2016. The highest level of total factor productivity change is 1.330 percent from 2011-2012. The lowest level of the TFPGH is 0.842 percent from 2010-2011.

Table 4: Company wise Average of Malmquist Productivity Index select Steel Companies in India during the period from 2006-2007 to 2015-2016

Company Name	EFFCH (Percentage)	TECHCH (Percentage)	TFPCH (Percentage)
Tata Steel Limited	0.937	1.080	1.012
JSW Steel Limited	0.935	1.082	1.014
Steel Authority of India Ltd	0.943	1.081	1.019
Star Ferro Alloys Limited	0.835	1.065	0.889
VISA Steel	0.885	1.035	0.978
Bhushan Steel	0.964	1.084	1.045
Jindal Saw Steel Limited	0.961	1.044	1.003
Ferro Alloys Corporation Ltd	0.942	1.043	0.983
Usha Martin Limited	0.979	1.030	1.008
Welspun Corporation Limited	0.988	1.041	1.029
Mukand Steel Limited	0.925	1.070	0.990
APL Apollo Limited	0.887	1.061	0.968
Jindal Steel Limited	0.943	1.073	1.012
Ashirwad Steels Industries Ltd	0.878	1.070	0.939
Bajaj Steel Industries Limited	0.845	1.058	0.902
AVG	0.923	1.068	0.986

Source: Annual reports and Journals.

Table 4 reveals that the company wise average of Malmquist Productivity Index is 0.923 percent of efficiency change during the study period from 2006-2007 to 2015-2016. The highest level of efficiency change Welspun Corporation limited is 0.988 percent. The lowest level of efficiency change Star ferro alloys limited is 0.835 percent. It could be inferred that through majority of firms registered positive growth of efficiency change in selected steel companies in India.

The above table shows that technological change of average of

1.068 percent period from 2006-2007 to 2015-2016. The highest level of technological change Bhushan steel limited is 1.084 percent. The lowest level of technological change Usha martin limited is 1.030 percent from 2010-2011. It could also be observed from the technical change was positive for all the companies.

The above table presents the total factor productivity change in average of 0.986 percent during the study period from 2006-2007 to 2015-2016. The Bhushan steel limited has the highest level of total factor productivity change of 1.045 percent. The Star ferro alloys limited has the lowest level of total factor productivity change of 0.889 percent. The most of the company's positive growth of total factor productivity change in the study period.

Suggestions

- The Steel Companies need to concentrate more on labour i.e. Human resource development strategies have to be reoriented to enhance competitiveness in the context of both external and internal changes. The manpower planning system has to be redesigned to plan labour employment in the environment of upcoming technological development.
- The VISA Steel, APL Apollo Steel Limited and Ashirwad Steel should take necessary action to improve their net profit position by improving capital productivity, increasing market share in profitable regions focusing on the retail segment and value added products.

Conclusion

India is the third-largest steel producer in the world. In 2016, India produced 91.46 million tonnes of finished steel. Total finished steel production in the country increased at a CAGR of 7.45 per cent over financial year 2011–2016. Driven by rising infrastructure development and growing demand for automotives, steel consumption is expected to reach 104 million tonnes by 2017. Technavio's market research analyst predicts the Indian steel industry to grow at a CAGR of 7% by 2020. The present study is Productivity analysis of select Steel Companies in India from 2006-2007 to 2015-2016. The study found that even though the steel production has been increasing, the companies are not in a position to export more.

References

1. Balakrishnan. Productivity Measurement in Indian Industry, Madras university press, 1958.
2. Banerjee A. Capital Intensity and Productivity in Indian Industries Macmillian Publications, New Delhi, 1975.
3. Selvam, Vanitha, Babu. Astudy on Financial Health of cement Industry Z Score Analysis, Management Accountant, 2003.
4. Gurusamy S, Asdha Krishnan. Performance of the Companies Profitability, Gitam Journal of Management, 2010.
5. Manjappa DH, Mahesha M. Measurement of Productivity Growth and Efficiency change and Technical Progress of Selected Capital Intensive and Labour-Intensive Industries During reform period of India, Indian Journal of Economics and Business, 2008.
6. Mansur Mulia A. Z Score Analysis for Evaluation of Financial Health of Steel Mills – A case Study", Abhigyam, 2002.
7. Sastry. Measurement of Productivity and Production Function in Sugar Industry in India 1951-1961", Indian Journal of Industrial Relations, 1966.
8. www.moneycontrol.com.
9. www.ministryofsteel,goi.com.
10. www.ministryofcommerceandIndustry.com