



Performance of steel Industry in India: Evidence from SAIL and TISCO

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Abstract

The economic performance of firms can be measured in terms of their growth as well as increasing expenditures on superior technologies; though profitability of the firms has remained most widely used index for measuring performance. However, on the one hand effective and efficiency performance of company can be measured in terms of profitability, on the other hand productivity growth is also been recognized as a key feature of economic performance. Therefore the present paper analyzes the performance of selected firms in terms of profitability as well as their productivity. There is considerable debate that in the era of liberalization performance of firms has been affected in public and private sectors differently. Steel is a very important commodity in the world trade and India has always participated in this trade both as an importer and as an exporter. In what follows we attempt to ascertain the impact that reforms have had on steel at firm specific level. Therefore, in present paper we attempt to analyze the performance of firms operating in public as well as private sector in steel industry. To represent these two sectors we took SAIL from public sector and TISCO from private sector. To find out the relationship between profitability and productivity of the SAIL and TISCO, ordinary regression model (OLS) has used. The regression analysis shows that the TFP is the prominent variable in explaining profitability of both the firms.

Keywords: profitability, productivity, SAIL, TISCO

1. Introduction

The structure of the Indian economy has achieved a remarkable change after independence. It has been transformed from an agriculture-based economy, which relied heavily on primary commodities production for exports to a manufacturing sector based economy. The share of the agriculture sector in the gross domestic product (GDP) dropped from 56 percent in 1950-51 to 40 percent in 1980-81 and further to 19 per cent in 2006-07. On the other hand, the share of the manufacturing sector increased from 13 percent in 1950-51 to 17 percent in 1990-91 and further to 24 per cent in 2006-07 (Central Statistical Organization, 2007). A high rate of industrial development characterized by an increasing share of industrial output in gross domestic product (GDP) of an economy is an essential condition to achieving a sustained rise in rate of growth (UNIDO, 1997).

The Liberalization, Privatization and Globalization (LPG) policies that started in early 1980s in India, and strengthened in the 1990s, opened the Indian manufacturing sector to greater competition from within as well as from outside. One of the major components of the economic reforms package has been the deregulation and delicensing in the manufacturing sector. The justification provided for this often centers on the reason of encouraging competition, which, in turn, is expected to enhance the efficiency and productivity performance of the manufacturing sector. Given that the main objective of reforming the manufacturing sector was to improve industrial productivity, it would be appropriate to probe how far the reforms have contributed to the productivity performance of the Indian manufacturing sector.

The recent economic reforms have affected the manufacturing

sector on four counts. First, with the abolition of industrial licensing private sector were able to build and expand their capacity without any regulation. Production of consumer durable goods started to meet the pent-up demand, which was not available under import substitution policies (Chandrashekhar, 1996) [2]. Secondly import quantitative regulations were relaxed and Indian manufacturer could therefore import capital and intermediate goods easily. Third growth rate of public investment has decelerated. Also, the share of private corporate sector in total investment increased. Fourth, the private sector had now the option to produce money from financial market in addition to bank lending.

In this light/ perspective the effect of trade liberalization on firms has been a matter of considerable debate. On the one hand the traditional infant industry argument maintain that the removal of protection result in large number of firms becoming bankrupt. On the other hand, proponents of liberalization maintain that the effect should be marginal, as only the very inefficient firms will exit, the other firms being forced by competition to improve their performance.

In this paper, we consider whether the latter is true. Another important objection of this paper, which makes it unique of its type, is to examine inter-sectoral comparison in terms of public and private. There is considerable debate that in the era of liberalization performance of firms has been affected in public and private sectors differently. Therefore, in present paper we attempt to analyze the performance of firms operating in public as well as private sector in steel industry. To represent these two sectors we took SAIL from public sector and TISCO from private sector. Steel is a very important commodity in the world trade and India has always

participated in this trade both as an importer and as an exporter. In what follows we attempt to ascertain the impact that reforms have had on steel at firm specific level.

The industry has been chosen, first because it has been completely decontrolled while other important intermediate goods like fertilizers and petroleum are yet to be deregulated. Second, broadly speaking it can be called homogeneous good, in the sense that consumer would not be primarily driven in its purchase by the identity of the producer. Though some steel firms have made attempt to brand their products, we assume that the overall impact of these efforts to decrease substitutability between outputs of rival firms is insignificant. Given the nature of the product, this does not seem to be an unreasonable assumption. This is important because if there is reason to believe that firms have achieved substantial product differentiation, then inter-firm differences in all financial performance and market structure need to be interpreted with caution. In the case of reasonably homogeneous product, inter-firm differences have a rather straightforward interpretation.

The rest of the paper is organized as follows. Section II describes the methodological framework and the data sources. Section III presents the main empirical results and the section IV concludes.

2. Methodology (Theoretical Framework)

The economic performance of firms can be measured in terms of their growth as well as increasing expenditures on superior technologies; though profitability of the firms has remained most widely used index for measuring performance. However, the traditional SCP (Structure Conduct Performance) framework has tended to concern itself almost exclusively with profitability as a performance indicator.

The study of profitability over time across a number of industries provides important insights into their relative efficiency levels. It also helps in predicting amounts of future resources that will flow into these industries. Keeping in view the social concern relating to employment generation, this analysis may serve as the basis of the policy aimed at regulating investment into various industries through taxation and other means.

The commonest definitions of profitability have been the rate of return on net assets and price-cost margin of the firm. Ideally, the price-cost margin should be the difference between the price charged by the firm and its marginal cost in production. It is considered to be the most appropriate measure of profitability in general and for studying the SCP framework in particular. Cowling and Waterson (1976)^[3].

More specifically, two measures of profitability have been widely used in most of the empirical studies conducted in this regard. Firstly, price-cost margin either P/AC or P/MC is used as the dependent variable directly (Collins and Preston 1969)^[4], Shepherd (1972), Cowling and Waterson (1974). Secondly, price cost margin in profit rate form that is P-AC/AC or any other variation of it is taken as the dependent variable for regression analysis (Bain 1951, 1956)^[6, 7], Stigler (1963)^[8] Mann (1966)^[9], Hall and Weiss (1967)^[10], Comanor and Wilson (1967)^[11]. Here P represents price, AC and MC are average cost and marginal cost respectively.

Effective and efficiency performance of company can be

measured in terms of profitability, therefore profitability trends has been analysed in the following section. Profitability of the selected firms is being measured as gross profit to net sales ratio for the purpose of present study. Gross profit ratio is calculated as follows:

$$\text{Gross Profit Ratio} = \frac{\text{PBDIT}}{\text{Net Sales}}$$

Here, PBDIT is profit before depreciation, interest and tax.

There is one more feature, which makes the present paper unique in it, is that it analyzes the performance of selected firms in terms of profitability as well as their productivity. It seeks to provide a comparative framework. Productivity is “what you get out for what you put in”. It expresses the relationship between output of goods and services or real output and the various inputs required for production.

Productivity growth is recognized as a key feature of economic dynamism today. Fabricant (1964) defined productivity as the power to produce economic goods and services. According to Kuznets (1966), an essential element in the development and structural transformation of the developed economies was the fast growth in industrial productivity (Duraisamy, 2000).

The literature on productivity in India has also made an attempt to examine the relationship between economic reforms and manufacturing productivity. Some studies have showed that the total factor productivity growth has improved in the reforms period (Krishna and Mitra, 1998; Pattnayak et. al, 2003; Unel, 2003) whereas the studies by Goldar and Kumari (2003) and Balakrishnan, Pushpangadan, and Suresh Babu (2000) have found that economic reforms have adversely affected industrial productivity. These studies have examined manufacturing productivity either at the sectoral or industry levels.

There is quite a good number of industry specific studies in this regard but a very few studies attempt to make a detailed analysis of total factor productivity of the industrial sector. The obvious limitation of these studies is that as the time period covered by studies is relatively small, they are not able to capture the effect of shift in policy regime on the productivity.

There are three approaches to the measurement of TFP, namely, parametric approach, accounting approach and non-parametric approach. Most studies on productivity of India have relied on the growth accounting approach. This approach is popular because computations involved are simpler and it does not require any econometric estimation. As such, the data requirements are minimal. It has also several useful properties [Diewert (1976), Christensen (1975), Capalbo and Vo (1988)]. Thus, the Tornquist-Divisia index is used in the present paper for estimating state-wise total factor productivity indices for Indian manufacturing sector. The general formula of Tornquist-Divisia index is given below;

$$\ln TFP_t = \ln(O_t/O_{t-1}) - 1/2 * (S_{L,t} + S_{L,t-1}) * \ln(L_t/L_{t-1}) - 1/2 * (S_{K,t} + S_{K,t-1}) * \ln(K_t/K_{t-1})$$

Where \ln TFPT is the log of total factor productivity index and Q_t and Q_{t-1} are the value added at constant price at time t and $t-1$, respectively. S_L and S_K are the shares of labour and capital in total cost at time t and $t-1$, respectively. L and K are the quantities of inputs i.e. labour and capital respectively.

Growth Rate

A widely accepted exponential model, $y = a b^t e^u$, has been fitted to the time series data for estimating growth rates of area, production, yield, TOI, TII and TFPI. The logarithmic form of this function is given by;

$$\ln(y) = \ln(a) + t \ln(b) + u$$

Where, y is the dependent variable whose growth rate is to be estimated.

t is the independent variable (Time)

u is the disturbance or error term.

a and b are the parameters to be estimated from sample observations. The regression coefficient b is estimated by ordinary least squares (OLS) technique.

The Compound Average Growth Rate (CAGR) in % term is estimated as:

$$\text{CAGR} = \{\text{antilog}(b) - 1\} * 100$$

Regression Model

To find out the relationship between profitability and productivity of the SAIL and TISCO, ordinary regression model (OLS) has used. The regression models are given below;

$$\begin{aligned} \text{PROFIT_SAIL} &= \alpha + \beta \text{TFP_SAIL} + U_i \\ \text{PROFIT_TISCO} &= \alpha + \beta \text{TFP_TISCO} + U_i \end{aligned}$$

Measurement of Variables

Output (Q)

Out of the two measures of value added namely, net value added and gross value added, we have used the latter. In this paper, the Wholesale Price Index (WPI) for manufactured products has been used to deflate the nominal values of gross value added.

Labour (L)

Total number of persons engaged is taken as the measure of labour input. As both workers, working proprietors and supervisory/managerial staff can affect productivity, so number of persons engaged is preferred to number of workers.

Capital (K)

Gross fixed capital stock at constant (1993-94) prices is taken as a measure of capital input. Capital stock for the subsequent years has been arrived at by adding the real investment figures to the stock of capital of the previous year. The relationship between gross fixed capital stock in year t is denoted by K_t , the benchmark capital stock.

Emoluments

Total emoluments primarily constitute wages to workers, provident fund (PF) and other benefits and so on. To estimate real emoluments, the nominal value has been deflated by Consumer Price Index.

Data Source

We use firm-level data from the Prowess database. The sample period is from 1991-92 to 2014-15 for productivity analysis and profitability analysis covers the time period from 2000-01 to 2014-15. The data are collected by the Centre for Monitoring the Indian Economy (CMIE) from company balance sheets and income statements.

3. Empirical Findings

This section mainly analyses the trends in profitability and total factor productivity in SAIL and TISCO, and then explores the factors responsible for the variations in it. In this study we have estimated profitability and total factor productivity indices for SAIL and TISCO. As such these firms could reasonably be taken as representative of the steel sector of India.

Total Factor Productivity

The productivity analysis has been conducted after economic reform period i.e. 1990-91 and its covered twenty five years time period i.e. 1990-91 to 2014-15. The selection of the durations of this period has been largely influenced by considerations of policy shifts that took place from one period to the other. The main feature of this analysis is that the results have been interpreted in the context of prevalent economic environment as it has been conditioned by the policy changes. The trends of total factor productivity, growth rates and coefficient of variation are given by Table 1 as well as in Figure 1.

It is evident from the table that TFP of both the firms has increased manifold during the period under present study. But the productivity performance is better in TISCO as compared to SAIL on the one hand. On the other hand it is fluctuating also in case of both the firms but again the coefficient of variation is 219.02 in SAIL which is greater as compared to TISCO where it is 190.03.

Table 1: Trends of total factor productivity

Year	Total Factor Productivity (TFP)	
	SAIL	TISCO
1990-91	100.00	100.00
1991-92	121.80	105.00
1992-93	121.20	105.80
1993-94	107.50	83.50
1994-95	120.90	106.80
1995-96	124.90	110.70
1996-97	109.50	112.60
1997-98	100.10	121.70
1998-99	85.10	122.50
1999-2000	93.10	116.90
2000-01	141.00	110.80
2001-02	115.10	134.90
2002-03	162.70	123.10
2003-04	231.80	167.20
2004-05	287.10	219.90
2005-06	241.30	224.30
2006-07	303.50	238.60
2007-08	280.00	259.00
2008-09	288.20	279.50
2009-10	292.30	299.90
2010-11	296.40	320.40
2011-12	300.50	340.90
2012-13	304.60	361.30
2013-14	308.70	381.80
2014-15	312.80	402.25
Average TFP	193.2	189.5
Standard Deviation (SD)	90.40	104.18
Coefficient of Variation (CV)	219.02	190.03
Compound Annual Growth Rates (CAGR)		
First Period	-2.41	2.52
Second Period	6.51	9.90
Over All	6.22	6.88

Sources: Author's calculations

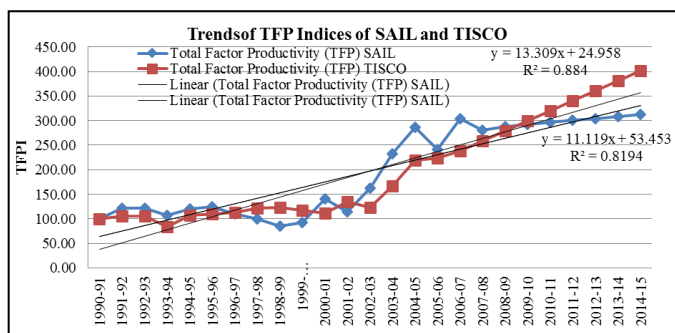


Fig 1

Profitability

It can be noted from the table (2) that gross profit to sales ratio of SAIL increased initially during the study period. Gross profit to sales ratio was 16.26 percent in 2000-01 which sharply fell down to 8.71 percent in the next year. Again it starts increasing up to 2004-05 but afterwards it almost kept on decreasing and came down to 12.41 percent in 2014-15. The average of gross profit ratio was 21.37 percent which further can-not be regarded as favorable. The decreasing trend of the ratio indicates an inefficient management. The gross profit to sales ratio registered the declining trend mainly because of increase in the cost of production. The company can adopt cost effective techniques so that sales can be

increased and in turn profitability may increase.

The gross profit to sales ratio in case of TISCO initially registered an increasing trend up to 2010-11. It was 25.94 percent in 2000-01 which declined first to 17.48 in next year (same as in case of SAIL). However it also increased to 24.77 percent in 2002-03 and maintained this increasing trend up to 2011-12 where it reached to a very high level of 43 percent. The average of this ratio was almost 35 percent which can be treated as favorable position. But the slightly fluctuating trend in this ratio after 2010-11 can be considered as threat to current policy adopted and the company management should adopt a cost reducing technique of production.

On the basis of the average of the gross profit to sales ratio it can be concluded that TISCO performed better than SAIL as the average profit ratio in case of SAIL is 21.37 and in case of TISCO it is found to be 34.90. Further, a higher value of SD and coefficient of variance in case of SAIL as compared to TISCO suggest that profitability performance is more consistent in TISCO while comparing to SAIL.

Table 2: Performance of Profitability in SAIL and TISCO Steel Industry

Year	SAIL	TISCO
2000-01	16.26	25.94
2001-02	8.71	17.48
2002-03	14.64	24.77
2003-04	23.09	32.54
2004-05	38.83	41.85
2005-06	26.56	40.55
2006-07	32.19	41.68
2007-08	32.45	44.93
2008-09	24.98	40.16
2009-10	28.99	40.68
2010-11	20.89	43.06
2011-12	16.28	38.11
2012-13	11.99	29.72
2013-14	12.33	32.27
2014-15	12.41	29.87
Average Profit during Study	21.37	34.90
Standard Deviation (SD)	9.08	8.09
Coefficient of Variation (CV)	42.48	23.17
Growth Rate (2000-01 to 2014-15)	-1.47	2.26

Sources: Author's calculations

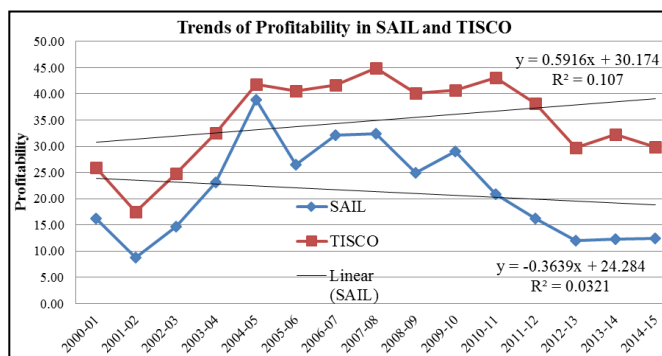


Fig 2

Regression Results

A regression analysis was performed to establish relationship between gross profit to sales ratio and total factor productivity (TFP). The results are present in Table 3 and 4.

In case of SAIL overall explanatory power of regression of TFP appears to be high. It is apparent from the coefficient of determination R² is very high at 0.76 percent with a t-value of 6.21. It establishes a positive and highly significant relationship between gross profit to sales ratio and TFP. It can also be noted that with every unit increase in TFP, gross profit ratio increases by 1.74 percent.

Table 3: Regression Results for SAIL

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Source | SS df MS Number of observations = 14
-----+-----
F(1, 12) = 38.54
Model | 1.42864643 1 1.42864643 Prob > F = 0.0000
Residual | .444865127 12 .037072094 R-squared = 0.7626
-----+-----
Adj R-squared = 0.7428
Total | 1.87351156 13 .144116274 Root MSE = .19254
-----+-----
Profit_SAIL | Coef. Std. Err. t P>|t| [95% Conf. Interval]
-----+-----
TFP_SAIL | 1.748383 .2816423 6.21 0.000 1.134738
2.362029
Constant| -.1034516 .0565086 -1.83 0.092 -.2265732 .01967
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Table 4: Regression Results for TISCO

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Source | SS df MS Number of observations =14
-----+-----
F (1, 12) = 0.18
Model |.007870577, 1.007870577, Prob > F = 0.6827
Residual |.538102026 12.044841835 R-squared = 0.0144
-----+-----
Adj R-squared = -0.0677
Total | .545972603 13 .041997893 Root MSE = .21176
-----+-----
Profit TISCO | Coef. Std. Err. t P>|t| [95% Conf. Interval]
-----+-----
TFP_TISCO |.210303 .5019771 0.42 0.683 -.8834112
1.304017
Constant | .0074847 .0765477 0.10 0.924 -.1592985 .1742678
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The regression is insignificant for TISCO as R² is 0.014 only with a t-value of 0.42 only. The value of coefficient being 0.21 indicates that with every unit increase in TFP, gross profit to sales ratio increases by 0.21 percent only. The overall equation depicts a positive though insignificant impact of TFP on profitability.

The inference can be drawn that improvement in TFP has positive implication on the profitability of both the firms. World class productivity aims to reduce inputs without sacrificing output by improving and streamlining the conversion process. The analysis of TISCO and SAIL proves that productivity can be increased only if they are immune from cost increases and inflation. The more productive or firms with higher productivity can compete market

environment, while less productive one has no choice but to exit the market.

To conclude, the regression analysis shows that the TFP is the prominent variable in explaining profitability of both the firms i.e. SAIL and TISCO. Due to intense competition, even though the SAIL has achieved good TFP index but it failed to achieve higher profit ratios. In other words a higher productivity yield has hampered SAIL. Although SAIL has almost maintained its gross profit ratios at constant level from 2004 onwards to 2014, even though prices of steel dipped after the financial recession because of them having large raw material reserves in India and also because of their product mix. However R&D and use of modern technology is still limited at SAIL and thus their TFP can still be further jacked up, increasing its profitability.

TISCO has also maintained its gross profit ratios at constant level during the entire period of this study even though slowdown in the steel prices because of the constant R&D efforts to improve TFP and targeting greater operating efficiency.

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