Does Export Intensity Affect Firm Performance? Evidence from Basic Metal Industry in India

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With technological advancement, the world has shrunk in the form of a 'global village'. Acknowledging this fact, the main question of this study is going to be: whether participation of a firm in the global market (in the form of export of its finished produces into the world-wide end points) has an effect on its performance or not? Here we take into account the experience of basic metal industry in India during 2000-01 to 2014-15 for the reason that it is having a vital role in the prosperity of Indian economy. Further, the growth of sectors such as agriculture, transportation, communication and infrastructure are at the mercy of basic metal industry's growth. The study uses Data Envelopment Analysis (DEA) methodology by taking Input output data of 147 companies that come under basic metal industry classification have been taken for the analysis. In the first stage of analysis technical efficiency of all companies has been calculated. Only five sub-groups namely aluminium & aluminium products, castings & forgings, metal products, steel and steel pipes & tubes have been considered for the group frontier analysis and for estimating Technology Closeness Ratio (TCR). With a view to identify the impact of export variable on the performance of firms, simple regression technique is being used in the later stage using Technical efficiency scores as dependent variable and export intensity of firm as independent variable. For controlling the impact of other variables that may influence technical efficiency, the study uses transport and communication infrastructure, credit intensity, age of firm, size of firm, total technology expenditures intensity and marketing intensity as explanatory variables other than export intensity. Eventually we found a significant negative relation between export intensity and firm performance. This is in contrast to the learning by exporting proposition anticipated in earlier literatures.

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I. Introduction

The progress of human society is the manifestation of discovery of metals. Metals have played a vital role in the development of economy as a whole. Since metals or metal products serve as a crucial input to different sectors of any country, development of metal industry is indispensable for the overall growth of the world economy. Experience of Indian economy is not an exception in this context. It has been found that the share of basic metal industry in Aggregate Gross Value Added (GVA) by the Factory Sector in India stands first during 2008-12. In 2012-13 basic metal industry had the second largest share (10.19 percentage) in GVA of Industrial Sector in India. Further, basic metal industry employs 8 percentage of total number of persons engaged in the industrial sector in India (Annual Survey of Industries, 2008-09 to 2012-13).

Basic Metal can adds on the prosperity of all sectors in the economy. The growth of sectors such as agriculture, transportation, communication and infrastructure are at the mercy of basic metal industry's growth. The low labour wage rate and abundance of quality manpower along with mature production base add in to the advantage of India as a producer and further the exporter of basic metals and products.

Once we spell out the trading volume of India's basic metal industry in to the global market, the figures that of iron and steel are worth mentioning. Country's share in the world exports of these two foremost basic metal categories were only 0.128 and 0.228 percentages during the periods 1980 and 1990 respectively. Fortuitous fact is that, it has marked up into 0.926 percentage in the year 2000 and yet again towards 2.5 percentage with a worth of 12 Billion dollars in the year 2014! (WTO 2014).

Accommodating the aforementioned evidences, this study is trying to appraise the performance of basic metal industry in India and factors behind it for the last fifteen years. In these days of globalization and technological advancements, the world has been shrunk into the form of a 'global village'. Acknowledging this fact, the main question of this study is going to be: whether participation of a firm in the global market (in the form of export of its finished produces into the world-wide end points) affects the performance of it or not?

The rest of the paper is organized as follows. Section II has a brief review of literature, which covers the earlier studies and methodological discussion on performance analysis with special reference to basic metal industry in India. Section III is trying to articulate the general features of basic metal industry in India. Then in the Section IV, we discuss the methodology and data-set used in this study followed by analysis, results and findings in the Section V. The final section concludes.

II. Earlier Studies

Performance measurement is quantifying, either quantitatively or qualitatively, the input, output or level of activity of an event or process. Actions based on performance measures and reporting can result in improvements in behaviour, motivation and processes and promotes innovation. The two most important aspects of performance are generally considered to be efficiency and effectiveness. It is the measurement of efficiency that has dominated operations management since the start of the industrial revolution (Barnes, 2007).

Efficiency analysis nowadays becomes an interdisciplinary field in the sense that it can be successfully applied to any kind of activities, where one can think of some production activity is happening, and that again spanning over the disciplines like economics, operations research and management sciences, and engineering, and the like. Theory and methods of efficiency analysis are utilised in several application fields including agriculture, banking education, environment, health care, energy, manufacturing, transportation and utilities (Johnson and Kuosmanen, 2015).

Two foremost measures of efficiency are suggested in the literature. To begin with, technical or productive efficiency refers to the use of productive resources in the most technologically efficient manner (Worthington, 2004). Put differently, technical efficiency implies the maximum possible output from a given set of inputs. Secondly, allocative efficiency talk about a firm's success in choosing an optimal set of inputs with a given set of competitive input prices (Sengupta, 1998) In Farrell's (1957) words, a productive unit can be inefficient either by obtaining less than the maximum output available from a determined group of inputs (technically inefficient) or by not purchasing the best package of inputs given their prices and marginal productivities.

Technical efficiency can be measured using either parametric or non-parametric approaches. The parametric approach make use of econometric estimation method to construct technology frontier. Deterministic methods comprises of Corrected Ordinary Least Square (COLS)(Winsten, 1957) Method, Modified Ordinary Least Square (MOLS) (Afriat 1972 and Richmond 1974) Method and Goal Programming Approach (Aigner and Chu 1968) and The Stochastic Frontier Approach are the methods in parametric approaches of estimating technical efficiency((Kumbhakar and Lovell, 2000). The most celebrated non-parametric method of estimating technical efficiency is Data Envelopment Analysis (DEA) based on mathematical Programming problem[3]. This method involves the use of linear envelopment frontier over the data points such that all observed points lie on or below the production frontier and a comparison is making between the observed values of inputs or outputs with this frontier value in order to estimate the technical efficiency(Coelli, 2008).

Performance of India's manufacturing sector and factors explaining it are widely addressed issues in efficiency and productivity analysis literatures. Among these most of them considering Technical Efficiency of Decision Making Units as a yardstick of analysing performance. While some studies using Non-Parametric method of measuring Efficiency to assess the performance of the units under study (Ray (2002), Kumar and Arora (2011), Bhandari and Ray (2012)), a number of studies are using Stochastic Frontier Analysis as a tool for assessing the performance of manufacturing units in India (e.g. Madheswaran et al (2007)). Meanwhile, handful studies are going in for more than one method in their study to probe if their findings are varying with the methodology they used rather (e.g. Bhandari and Maiti (2012), Kathuria et al. (2013)).

Considerable amount of comments on basic metal industry in India can be found in earlier studies. Large amount of them talks about the role of this sector and its sub sectors in the overall growth of Indian economy. While some studies are optimistic about the future prospective of the basic metal industry, a couple of studies have the flip-side of the story. They are after calling the attention to the challenges that this sector facing. A brief account of these literatures is given in the coming discussion.

In his study regarding the Steel Industry of India, Slater (1925) appeals that: both iron and steel production are of extreme antiquity in India, which, indeed, may very likely be the original home of both of these arts. Extraordinary abundance of very high grade ores is a favourable factor for the growth of iron and steel industry in India. In quality and quantity of known iron ore deposits, India is one of the best-endowed countries in the world. The deposits are the largest and best in Asia, with the possible exception of deposits in Soviet territory. In this rich iron supply lies India's greatest natural advantage for the development of heavy industry (Brush 1925).

[3] Detailed account of this methodology is given in section after next

In its strategic goal of National Steel Policy stated, Government of India (2005) aspiring its long-term goal of it as *having a modern and efficient steel industry of world standards, catering to diversified steel demand*. So the focus of the policy would therefore be to achieve global competitiveness not only in terms of cost, quality and product-mix but also in terms of global benchmarks of efficiency and productivity.

Evaluating the Technology Closeness Ratio (TCR) of Economic units can be considered as one of the worth mentioning improvements in the area: Efficiency and Productivity Analysis. The origin of this concept can be perceived in the earlier works of Hayami (1969) and Hayami and Ruttan (1970), where they introduced the concepts called *Meta frontier* and *group frontiers*. Later, this approach got much attention once Battese et al. (2004) used this model to analyse data panel of garment firms in five different regions of Indonesia, for the reason that the meta-frontier enables obtaining TEs of firms operating under different possible technologies. As far the empirical literature in India is concerned, Bhandari and Maiti (2012) and Bhandari and Ray (2012) have done the similar kind of analyses on the basis of group frontier vis-à-vis meta-frontier comparison, respectively for the leather and textiles industry.

Allow for export intensity as the main variable of interest of this study, a growing body of literature can be find that characterizing the relation between performance and export decision of firms. For instance, using a panel of 9292 UK manufacturing firms over the period 1993–2003, Greenaway et al. (2007) explore the links between firms' financial health and their export market participation decisions. They found that exporters exhibit better financial health than non-exporters. It has recognized that plant productivity evolves endogenously in response to the plant's choice to export. High-productivity plants have particularly large benefits from exporting. This leads to the self-selection of high productivity plants into export and R&D (Aw et al. 2011).

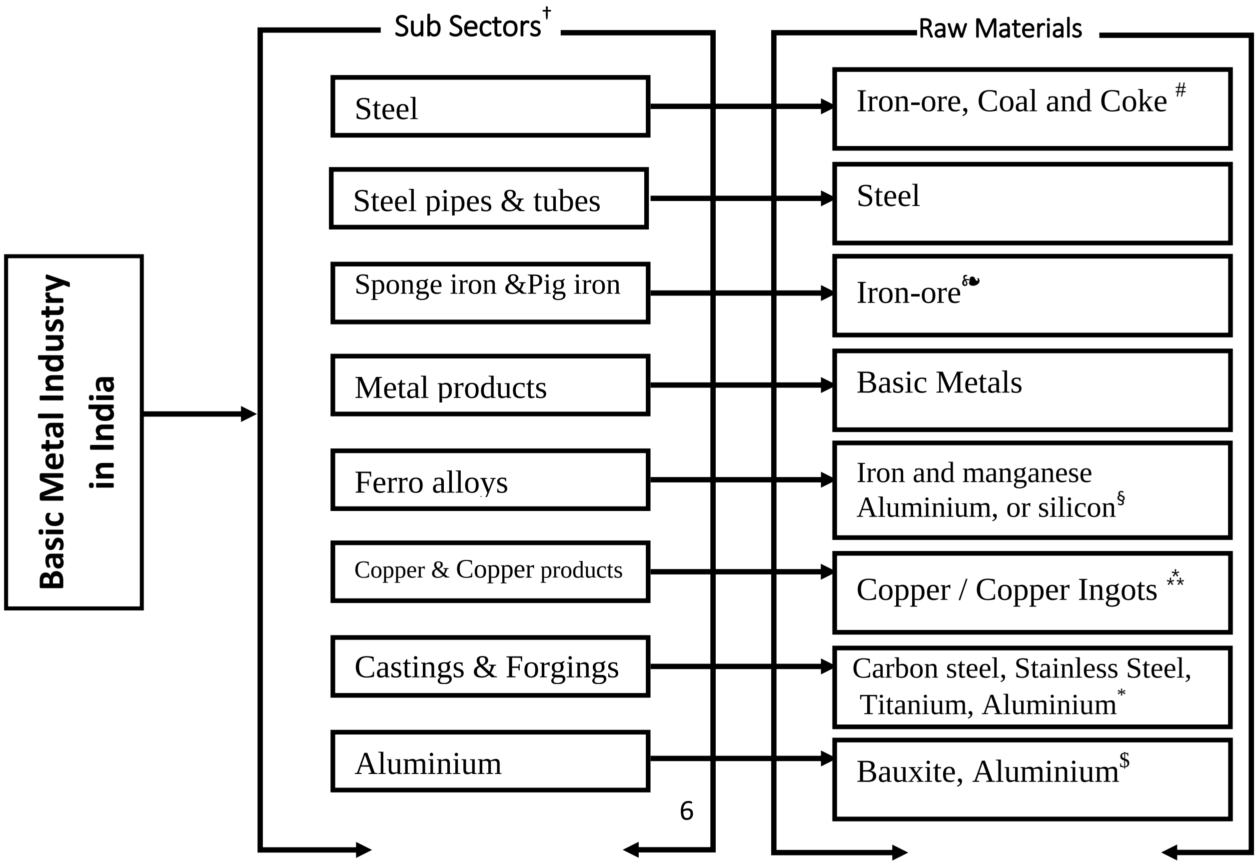
Stronger competition in foreign markets forces firms to improve both products and processes and thus remain competitive. Exporting have a scale effect on the firm since it extends the market over which margins may be earned, and since many costs, such as R&D, are largely fixed, such investments may be recouped over a larger sales volume. This aids productivity, and provides greater incentives to invest in R&D and innovation (Ganotakis and Love, 2012)

Abor (2011) examined the effects of export status and export intensity on the performance of firms in Ghana for the period 1991–2000. This study used productivity (output/capital) and profitability as the proxy of firm performance. Result states that export orientation bring about increased firm productivity and economic growth and export-oriented firms are capable of exhibiting high growth prospects because they are able to acquire international knowledge, product-design techniques, and technological spill overs accruing from international trade. (Abor, 2011). Likewise, the foreign contribution to the local knowledge capital stock increases with the number of commercial interactions between domestic and foreign agents. So being an exporter is expected to have a positive impact on firm performance (Grossman, G. M., & Helpman, E.1990).

III Basic Metal Industry in India: An Overview

Mining and metals are essential to the global economy and societal development. Standing at the beginning of most value chains, the sector is a critical supplier of essential materials and products and a global generator of trade, employment and economic development (World Economic Forum 2015). Basic Metals remain a key sector in India as it meets the requirements of across-the-board activities ranging from agriculture to space technology. A brief classification of basic metal industry in India and their corresponding raw materials are given in the figure (1) below:

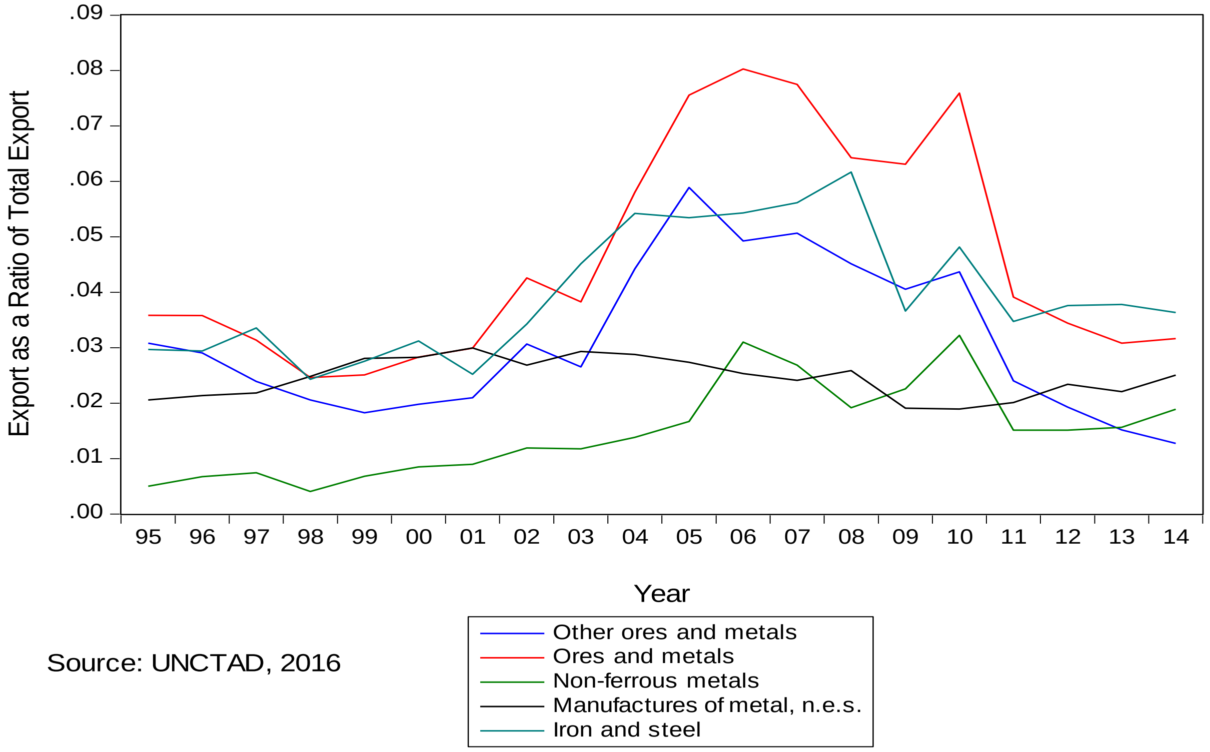
Figure 1. Basic Metal Industry in India and Their Corresponding Raw materials



Sources: [†]NIC India (2008) and CMIE Prowess, [#]World Steel Association (2016), [❧]Wakelin (1999), [§]Lisa et al. (2010), [**]GoI (CGIBM) (2011), [*]All Metals &Forge Group (2016) and [$]Hydro (2012)

Before going on to the micro level analysis of export intensity and its impact on the firm performance, the later part of this section is focusing on the macro perspective of export from basic metal industry in India for the period 1995-2014. Following figure (2) reviews the dynamics of basic metal industry's share of export as a ratio of total export of country. All the categories considered here have shown an increasing trend during the period between 2003 and 2010. Out of the ordinary fact is that, in the recent years share of all these categories in the total share of export from India is dipping as shown in the figure (2) below. The explanation for this leaves it open to question, for the reason that it goes beyond the promising scope of present study.

Figure 2 Export of Basic Metal and Metal Products from India as a Ratio of Total Export (1996-2014)



Source: UNCTAD, 2016

IV. Methodology, Data and Variables

Performance of firms under study is evaluated using technical efficiency scores estimated using Data Envelopment Analysis (DEA). The concept DEA is developed by Charnes, Cooper, and Rhodes (CCR, hereafter) in 1978 (for constant returns to scale characterization of technology) and later extended by Banker, Charnes, and Cooper (BCC, hereafter) in 1984 (to accommodate general variable returns to scale technology). In DEA, we create a benchmark technology from the observed input(s)–output(s) bundles of the firms in the sample. For this, we make the following general assumptions about the production technology without specifying any functional form. These are fairly weak assumptions and hold for all technologies represented by a quasi-concave and weakly monotonic production function.

Assumption 1: All actually observed input–output combinations are feasible.
Assumption 2: The production possibility set is convex.
Assumption 3: Inputs are freely disposable.
Assumption 4: Outputs are freely disposable.

Let y^j and x^j be respectively the output and input vectors of firm *j* (*j* = 1, 2, …. , *N*). Then, an inner approximation to the underlying production possibility set will be:

$$T = \left\{(x, y): x \geq \sum_{J=1}^{N} \lambda_j \, x^j; y \leq \sum_{j=1}^{N} \lambda_j y^j; \sum_{j=1}^{N} \lambda_j = 1; \lambda_j \geq 0 \; \forall \; j = 1, 2, \dots, N\right\} \qquad (1)$$

The input-oriented measure of technical efficiency of any firm *k* under the general BCC model requires the solution of the following LP problem:

Min θ

Such that

$$\sum_{j=1}^{N} \lambda_j x^j \leq \theta x^k \; ; \quad \sum_{j=1}^{N} \lambda_j \, y^j \geq y^k; \quad \sum_{j=1}^{N} \lambda_j = 1; \quad \lambda_j \geq 0 \; (j = 1,2, \dots., N) \qquad (2)$$

Let (θ^*; λ_1^*, λ_2^*,…, λ_N^*) be the optimal solution for (2). Define $x_*^k = \theta^* x^k$. Then (x_*^k,y^k) is the efficient input-oriented radial projection of (x^k,y^k) onto the frontier and the TE of the firm *k* (under VRS technology) would be $TE(x^k, y^k) = \theta^*$ itself.

Alternatively, the output-oriented measure of technical efficiency of the *k*th firm under BCC model is obtained solving the LP problem:

Max φ

Such that

$$\sum_{j=1}^{N} \lambda_j \, x^j \leq x^k; \quad \sum_{j=1}^{N} \lambda_j \, y^j \geq \varphi y^k; \quad \sum_{j=1}^{N} \lambda_j = 1; \quad \lambda_j \geq 0 \; (j = 1,2, \dots., N) \qquad (3)$$

Let ($\ddot{\varphi}$; $\ddot{\lambda}_1$, $\ddot{\lambda}_2$, …, $\ddot{\lambda}_N$) be the optimal solution for (3). Define $\ddot{y}^k = \ddot{\varphi} y^k$. Then ($x^k$,$\ddot{y}^k$) is the efficient output-oriented radial projection of (x^k,y^k) onto the frontier and the TE of the firm k (under VRS technology) would be, by definition, $TE(x^k, y^k) = {}^1\!/_{\ddot{\varphi}}$.

Even if the firms considering comes under same class, the technology they use all may not be unique. Within segments of activities, production technology may vary. Therefore measuring the technical efficiency of individual firms using a best practice technology of the all units in the whole industry will not give a complete picture. Using both group frontier and Meta frontier analysis will be convenient in this regard. A group frontier is constructed using only all the observations within the group considered and a *Meta frontier*, sometimes call *Grand frontier* is constructing by using all observations in all groups. The full range of technological alternatives described by the meta-production function is only partially available to individual producers in a particular group or country. In short, Meta production function as the envelope of the production points of the most efficient countries (Hayami and Ruttan, 1970). Measuring TCR is helpful to identify the inter-group (or regional) variations in the productivity and TE (Coelli, 2008).

This study has been conducted using input output value of 147 basic metal companies in India. The selection of sample for this study is largely guided by availability of data. Data on one output variable[4] and input variables collected from the Prowess Data Base of Centre for Monitoring Indian Economy (CMIE) for the period 2000-01 to 2014-15. The four input variables are labour[5], real value of raw materials, real value of power and fuel[6] and real value of gross fixed asset[7]. In the first stage of analysis technical efficiency of all the 147 companies has been calculated. Only five sub-groups namely aluminium & aluminium products, castings & forgings, metal products, steel and steel pipes & tubes have been considered for group frontier analysis and for estimating Technology Closeness Ratio (TCR).

With a view to identify the impact of export variable on the performance of firms, simple regression technique is being used in the later stage taking Technical efficiency scores (from meta frontier analysis) as dependent variable and export intensity of firm as

[4] Output variable is generate by adding up the monitory value of Sales and Change in Stock of each companies(Malik S K 2015)

[5] Wages and salaries have taken as a proxy of variable labour

[6] Raw materials of each categories of firm are considered as in figure (2). Nominal values of raw materials, power and fuel have adjusted so as to have real values. Whole sale Price Index (2004 as the base year) used for this purpose.

[7] Perpetual Inventory Method (PIM) is being used to convert historic cost (balance sheet figure) of fixed asset to replacement cost of it (see Balakrishnan et al.). Subsequently the nominal value of capital is being converted into real value of capital taking 2004-05 as base year.

independent variable. For controlling the impact of other variables that may influence technical efficiency found in earlier studies, we use other variables viz. transport and communication infrastructure (TCI), credit intensity, age of firm, size of firm, marketing intensity, and total technology expenditures Intensity of the firm. Technology expenditure comprises of research and development expenditure, royalty payments, technical knowhow fee, payments for technical services and licence fees.

Since there are only few companies for which values of total technology expenditures intensity is reported in the database we use, we have done two parallel regressions:

(a) One without the total technology expenditures intensity as an explanatory variable (Model I hereafter)

(b) Second, with total technology expenditures intensity as an explanatory variable (Model II hereafter)

Another variable that expected to have impact on firm performance is Outward Foreign Direct Investment (OFDI). But as a result of lesser participation of basic metals industry in Foreign Direct Investment Outflow from India and due to non-availability of reliable data over the study period this variable is not added in these two models specified above (see Appendix I for regression results after adding OFDI in to the Model I)

IV. Results and Findings

The output oriented technical score of each unit under study have been calculated using the above specified DEA method. The average technical efficiency score of each categories of basic metal industry in India for the period from year 2000-01 through 2014-15 are reported below. The Technical efficiency estimates of basic metal industry in meta-frontier analysis markedly shows that it sub-group pig iron and sponge iron; and steel performed better all along this period. Bottom most figures of efficiency score have been reported amongst castings & forgings and metal products groups (see Table 1).

As disclosed earlier, only five among the eight sub groups are being considered for group frontier analysis. This decision is mainly guided by the number of firms under each group. Result of which shown in the same table (1). Other than a mere measure of efficiency, this convention of calculating TE scores of units in group frontier is imparting the intra-group variation in the performance of each categories of basic metal industry. In this relation aluminium and aluminium products bagged the best performing pose all along this period. Despite the fact that metal products and steel held fragile among others until the year 2005-06, castings & forgings and steel took up this position during the period after 2006.

Category wise descriptive statistics of each variable used in the second stage analysis and Technology closeness ratio value of each group are given in the table (2). It is

castings & forgings companies recorded higher level of export intensity throughout the period of study. Similarly, aluminium & aluminium products and metal products have lower average export intensity. Higher technology expenditure is being reported among steel pipes & tubes and castings & forgings. While steel and metal products have better transport and communication infrastructure, greater credit intensity is being found in group castings & forgings. The estimates of Technology Closeness Ratio (TCR) point out greater variation between each category. While steel have an average of 0.96 over the period, casting and forging's average TCR is only 0.58. Likewise, steel pipes and tubes showing better performance that go next to steel and metal products having lower performance after casting and forgings. TCR of aluminium and aluminium products remains in between all the other categories as given in the table (2).

Table (3) shows the export intensity and firm performance relationship after controlling the effect of other variables that may have on the later variable. Export intensity is defined as the ratio of export to total sales of the firm (Wagner, 1995). Throughout the period except for three years, in model I the sign of coefficient associated with export intensity has been found to be negative. This is in contrast to the *Learning by Exporting* proposition anticipated in earlier literatures (Keller (2004), Crespi et.al. (2008)). Learning by exporting refers to the mechanism whereby a firm's performance improves after entering export markets. However, arriving at a solid conclusion about the above mentioned relation is not possible. For the reason that coefficients of export intensity in the first half of this period are found statistically insignificant. Only in the results of the later six years we found a significant negative relation between export intensity and firm performance. There are a few studies that found no significant relationship between export intensity and the technical efficiency levels of individual firms (Uğur 2004). But no studies have been found that explain a negative relation between export intensity and firm performance.

In model one size dummy found to be significant throughout the period with a positive sign. This result is in consonance with the progressive influence of size on firm performance as established in former studies (e.g. Biesebroeck, 2005). However, the status of size dummy changed in the model II. No significant relationship was found between the age of firm and efficiency scores in both models. As expected, improved transport and communication infrastructure have a positive impact on the performance of units. Conversely, credit has an undesirable influence on it. Marketing intensity is another variable that found to be

Table (2) Description of Variables and Average Value of Each Category During the Period 2000-01 to 2014-15

Variable	Description	Average value of each category during the period 2000-01 to 2014-15				
		Aluminium and aluminium products	Castings & forgings	Metal products	Steel	Steel pipes & tubes

Table (1) Technical Efficiency of Basic Metal Industry (2000-01 -2014-15)*

Category	Year														
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Aluminium & aluminium products	0.77 (0.946)	0.782 (0.933)	0.83 (0.97)	0.762 (0.984)	0.632 (0.982)	0.738 (0.973)	0.691 (0.982)	0.622 (0.98)	0.542 (0.979)	0.547 (0.991)	0.478 (0.982)	0.463 (0.971)	0.434 (0.991)	0.534 (0.99)	0.52 (0.989)
Castings & forgings	0.702 (0.913)	0.756 (0.898)	0.659 (0.898)	0.653 (0.879)	0.437 (0.909)	0.669 (0.905	0.637 0.899)	0.553 (0.894)	0.481 (0.932)	0.516 (0.907)	0.418 (0.954	0.39 (0.921)	0.393 (0.908)	0.33 (0.94)	0.311 (0.92)
Copper & copper products**	0.836	0.87	0.768	0.729	0.44	0.759	0.608	0.615	0.621	0.66	0.555	0.596	0.545	0.565	0.539
Ferro alloys**	0.788	0.778	0.747	1	0.524	0.935	0.856	0.669	0.58	0.607	0.47	0.46	0.466	0.471	0.463
Metal products	0.746 (0.947)	0.731 (0.882)	0.745 (0.915)	0.726 (0.806)	0.616 (0.68)	0.766 (0.928)	0.719 (0.947)	0.645 (0.929)	0.609 (0.939)	0.563 (0.929)	0.495 (0.944)	0.463 (0.948)	0.44 (0.941)	0.458 (0.958)	0.462 (0.959)
Pig iron**	0.859	0.917	0.813	0.832	0.748	0.994	1	0.979	0.906	0.988	0.996	0.976	1	0.953	0.982
Sponge iron**	0.626	0.696	0.717	0.768	0.626	0.91	0.923	0.867	0.845	0.927	0.896	0.857	0.838	0.822	0.827
Steel	0.858 (0.88)	0.759 (0.774)	0.801 (0.842)	0.769 (0.869)	0.719 (0.905)	0.836 (0.882)	0.875 (0.902)	0.863 (0.882)	0.871 (0.885)	0.857 (0.88)	0.834 (0.861)	0.882 (0.894)	0.877 (0.891)	0.839 (0.875)	0.838 (0.881)
Steel pipes & tubes	0.817 (0.959)	0.862 (0.969)	0.886 (0.949)	0.86 (0.924)	0.69 (0.914)	0.838 (0.911)	0.791 (0.968)	0.7 (0.954)	0.716 (0.96)	0.691 (0.925)	0.628 (0.968)	0.65 (0.97)	0.591 (0.962)	0.505 (0.94)	0.502 (0.947)

Note: *Figures in parentheses are mean Technical Efficiency of corresponding category from group frontier analysis.

**These categories are not taken account for group frontier analysis due to lesser representation in the sample.

Export Intensity	$\frac{Total\ Exports}{Total\ Sales}$	0.2233	0.2687	0.1696	0.1515	0.2458
Total Technology Expenditures Intensity	$\frac{\text{Total Technology Expenditures}}{Total\ Expenditure}$	0.0113	0.0198	0.0059	0.0129	0.043
Size Dummy[8]	D=1 for large firms D=0 otherwise	3	4	1	1	1
Age of firm	Current year-Year of incorporation	28.75	33.65	30.2424	26.659	27.1127
Transport and Communication Infrastructure (TCI)	$\frac{Value\ of\ TCI}{Total\ Assets}$	0.0072	0.0044	0.0091	0.0073	0.0059
Credit intensity	$\frac{Borrowings}{Total\ Assets}$	0.3251	0.4483	0.4319	0.4424	0.408
Marketing Intensity	$\frac{Total\ Marketting\ Expenditure}{Total\ Expenditure}$	0.0056	0.0114	0.0166	0.0082	0.0095
TCR	$\frac{Technical\ Efficiency\ Score\ \ (meta\ frontier)}{Technical\ Efficiency\ Score\ (\ group\ frontier)}$	0.6252	0.557	0.6617	0.9516	0.7431

Table (3) Nexus between Export Intensity and Firm Performance: Regression Results of Basic Metal Industry

	Model	Year													
		2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Number of Observations	I	90	93	92	92	86	93	95	99	102	99	96	94	92	93
	II	27	29	27	27	28	30	32	34	35	37	30	29	31	32
Export Intensity	I	-0.013	0.071	0.058	0.012	0.047	0.055	-0.051	-0.17*	-0.207*	-0.243**	-0.34***	-0.292**	-0.27**	-0.38***
	II	0.149	-0.076	-0.091	-0.401**	-0.036	0.062	0.223	0.109	-0.006	-0.233	-0.158	-0.901***	-0.455**	-0.563**
Total Technology Expenditures Intensity	I	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	II	-3.929	-15.127**	-4.366	0.471	-11.109	-3.586	-7.88*	-9.789**	-9.251**	-13.217	-6.988	-9.871	-7.219	-7.842
Size Dummy	I	0.042	0.032	0.058	-0.006	0.074	0.069	0.10***	0.12***	0.125**	0.064	0.098*	0.12**	0.11*	0.074
	II	0.17***	0.182*	0.17***	0.107*	0.153*	0.102	0.132*	0.20***	0.25***	0.145*	0.29***	0.224**	0.193*	0.064
Age of firm	I	-0.002*	-0.001	-0.001	-.0003	-0.001	-0.001	-0.002*	-0.002	-0.001	-.0008	0.001	0.001	-0.001	-0.001
	II	0.002	0.003	0.001	-0.002	0.002	0.001	0.002	0.002	0.001	0.001	0.002	0.002	0.002	0.001
TCI	I	-1.033	-0.762	-0.001	-2.692	-3.385	1.434	0.279	-0.002	2.193	0.645	0.72	1.058	0.745	4.454
	II	8.367**	6.259	-2.303	-0.429	-1.796	-0.72	0.319	2.838	0.991	2.739	2.304	10.483	10.591	14.43**
Credit intensity	I	-0.053	-0.126*	-0.063	-0.076	-0.113	0.03	-0.099	0.06	0.141	0.161	0.247*	0.217	0.155	0.084
	II	-0.432**	-0.078	-0.255*	-0.369**	-0.021	0.121	-0.214	-0.544*	-0.341	-0.236	0.25	0.058	0.178	0.315
Marketing Intensity	I	-1.022	0.214	-0.382	0.818	2.691	0.02	1.449	1.667	0.149	1.477	1.999	-0.166	-0.15	1.594
	II	0.279	5.065	1.423	1.294	4.044*	1.148	4.093*	3.465	3.892	4.067	5.367	5.153	1.116	-0.759
Constant	I	0.901***	0.859***	0.83***	0.859***	0.718***	0.798***	0.85***	0.73***	0.658***	0.639***	0.515***	0.536***	0.595***	0.614***

*Note: *indicates significance at the 10% level, ** indicates significance at the 5% level, *** indicates significance at the1% level.*

[8] Size is thus defined in the Prowess database as the three-year average of the total income and total assets of a company. Prowess companies are usually divided into size deciles. To make these deciles, we sort the Companies in descending order of size. This sorted list is divided into ten equal parts. Whole firms have classified as large and small. Category large consists of Deciles 1 and 2 (around 45% of firms) and deciles 3, 4 and 5 taken as small firms. Reported figures are mode of size of firms under each category.

	II	0.78***	0.419**	0.91***	1.076	0.681*	0.754*	0.669***	0.713***	0.691***	0.747***	0.403**	0.604***	0.529**	0.599***

insignificant in this study. The new total technology expenditure intensity introduced in Model II having significant coefficients only in four years with negative sign.

V. Discussion and Conclusions

Metals are commodities without which a modern industrialised economy cannot exist. Iron and steel in particular are ubiquitous and are central to meeting basic needs such as housing and mobility (ILO, 2016). Share to GVA, employment potential and share of basic metal sector in total export of country are evident of the fact that basic metal industries play a vital role in growth and development of the economy. Performance analysis of basic metal industry in India shown that sponge iron & pig iron and steel are the sectors have better performance as compared to other sub segments of the basic metal industry. The same figures confer a low-lying performance of casting & forging and metal products groups. A detailed analysis using Technology Closeness Ratio of subgroups anticipate that it is sub class steel's group frontier that lies closer to the grand frontier of the basic metal industry. Meantime, casting and forging's group frontier are far from the global frontier constructed for the period 2000-01 through 2014-15. It can be inferred that casting & forging and metal products companies in India are facing some unique bottlenecks in their functioning aside from the wide-ranging problems of basic metal industry altogether. This study tried to identify the factors determining the performance of basic metal companies, the same can be considered as reasons for inter group variations in firm performance also.

Extended analysis predicting that, access to better transport and communication infrastructure, credit availability, Total technology expenditures intensity, export intensity and size of the firm can be pronounced as few among the countless variables that may influence efficiency in particular and performance of firms in general of this industry. Study found predictable signs for the above mentioned variables in case of basic metal industry. However, the variable of interest of this study i.e. export intensity showed a different sign than what has been claimed by the past literature.

The significant negative coefficients of export intensity which was found for basic metal industry is a seldom found relation. It is precisely against the conventional wisdom that the firms having higher export intensity will perform better and vice-versa (Loecker 2013). Hence, agenda ahead is to explore in detail the characteristics of basic metal industry (primarily export intensity and technology expenditure intensity) and to reconsider the methodology used in this study in order to find the roots of these contrasting comments.

Appendix I

Outward Foreign Direct investment is expected to be another variable that may explain the firm performance difference in basic metals industry. For checking this possibility, we extent the analysis by adding value of OFDI as an explanatory variable along with other seven variables in one model and introducing dummy(OFDI Dummy=1, if firm having Outward FDI during period and 0 otherwise) in another model (see table A1)

Table A1: Regression result after adding OFDI as an explanatory variable into the earlier Model I

Model Specification	Value of OFDI as a variable			OFDI Dummy as a Variable		
Year	2011-12	2012-13	2013-14	2011-12	2012-13	2013-14
Number of Observations	12	15	16	92	93	91
Export Intensity	-0.765**	-0.352	-0.686*	-0.30***	-0.198	-0.343***
Age of Firm	-0.006	0	-0.001	-0.001	-0.001	-0.001
Marketing Intensity	1.568	-3.946	-2.37	-1.566	-0.196	-1.383
Credit intensity	0.294	0.286	0.446	0.057	0.072	-0.039
TCI	15.275	12.559	26.082	10.9***	11.7***	14.1***
Value of OFDI	0.001	0.003	-0.002	-	-	-
OFDI Dummy	-	-	-	-0.044	-0.004	0.006
Size Dummy	0.471**	0.46**	0.45**	0.199***	0.22***	0.17***
Constant	0.471*	0.27***	0.375***	0.637***	0.53***	0.628***

Monthly data on firm level OFDI from India from the month June 2011 are available in RBI website. Same data showing that while 12% of firms (18 out of 147) recorded OFDI in the year 2011-12, 14% of basic metals companies (21 out of 147) made OFDI to various countries during the period 2012-13 to 2014-15. Export intensity (with negative sign), Transport and Communication Infrastructure and Size of the firm are significant variables in the same way as in the earlier models. Results show that OFDI in not a variable that significantly contributing to the firm performance of basic metals industry in India.

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