Estimation of Technical Efficiency and Evaluation of Its Relationship with Export Performance of Organized Composite Textile Industry in India

Samir V. Kolte [1]
Dr. Mohd Afaq Khan [2]
Dr. Naseem Abidi [3]

Abstract

Textile Exports from India have been growing at a marginal pace over the past few years, facing stiff competition from established players like China, Bangladesh, Vietnam as well as emerging Asian and African nations. Growth of traditional retail in the largest markets for textile exports being the US and Europe has slowed down due to the emergence of e-com and reduction of inventories across the supply chain. Indian textile exporters need to improve their export performance to outgrow the competition and assume leadership positions. This research focuses on the export performance of the Organized Composite Textile industry of India with operational performance, measured as 'Technical Efficiency'. The study involved the estimation of Technical Efficiency using Stochastic Frontier Analysis (SFA). Technical Efficiency and Export Performance was evaluated for 52 firms of diversified size and representing all four regions in India. The firms were classified into 4 quarters according to the descending order of export revenue and comparison of their respective Technical Efficiency was carried out. It was found that firms in the top quarter (with higher export revenue) had higher Technical Efficiency and the firms with lower export revenue performed lower on Technical Efficiency. The study also revealed that Technical Efficiency, as well as Export Performance, do not differ significantly as per the size of the firms. This study provides a strong direction to the Exporters from India to focus on Operational Performance, to perform better in the Export Market.

Key words: Technical Efficiency, Export Performance, supply chain, leadership Operational Performance.

Received : 22.05.2020

Revised : 20.06.2020

Accepted : 23.06.2020

Introduction

Industries in India have been exposed to some of the unique initiatives and challenges during the last few years. The Government of India initiated 'Make in India', demonetization, and implementation of the largest reforms in Indirect Taxes (GST). Global markets have been observing several changes owing to the ongoing trade war between the US and China. Textile industry, while perceivably catering to one of the fundamental needs of the human being, faces different challenges and

[1] Research Scholar, Faculty of Management Studies & Research, Department of Business Administration, Aligarh Muslim University, Aligarh

[2] Associate Professor, Faculty of Management Studies & Research, Department of Business Administration, Aligarh Muslim University, Aligarh

[3] Professor & Head, Quality Assurance, Skyline University College, Sharjah

opportunities with each such transformation in domestic as well as global markets.

The Textile industry is globally one of the oldest and the largest Manufacturing industries. It contributes substantially to the industrial output, GDP as well as export earnings in India (Textile Industry Annual report 2017-18). The Ministry of Textiles, in the same report also mentions the total employment in the Textile Industry to be ~ 45 million people. At that amount, the industry employs the highest number of people among all the manufacturing industries.

As per Equity Master Report for Textile Sector (2017), structural changes are happening in the retail industry in the US leading to the profitability pressures caused by the e-tail boom. To counter the consequent fall in revenue levels, Indian exporters have been enhancing their share of the business with US e-retailers, however, at lower realizations. World Bank statistics (2018), forecast strong growth in the industrial manufacturing sector in India, leading to improvement in the Indian economy during the next three financial years. Indian Textile industry faces stiff competition from other exporting countries like Bangladesh, China, Pakistan, Sri Lanka, and Vietnam, and other Asian & African nations for the share of the global market. The industry needs a strong framework relating the operational performance, to the Export Performance at the firm and industry level.

The combined textile exports for Ready-made garments, cotton textiles, and manmade textiles is 83% of the total export by value. This indicates that the textile industry players involved in the manufacturing and export of these products are critical to the industry's Export Performance. The Ministry of Textile (2018) and Wazir Advisors (2017) estimate India's textile industry to continue growth at 11% CAGR to achieve ~ USD 220 billion of export revenue by 2021. The Technopak report endorses similar estimates, stating that the Indian textile industry is expected to grow at an average annual rate of 11% between 2011 and 2021 to touch US$ 221 bn.

Economic Efficiency is a distinct and inclusive measure of a firm's operational performance, endorsed by several industry experts. This comprises measurement of two primary factors to derive the firm's performance, as given below:

- Technical Efficiency – This is a measure of effective utilization of the firm's assets/equipment to generate revenue for the firm
- Allocative Efficiency – This is a measure of cost-effective utilization of resources like labor, material, energy, and others.

Economic Efficiency includes important factors responsible for the firm's performance, particularly for the Textile Industry in India. The current study is focused on evaluating the relationship between the operational performances of the textile industry players with the export performance. Existing literature was studied to compile different concepts and methods of measuring a firm's operational performance and export performance and their relationship. Since the majority of export revenue is generated by composite and organized players in the Textile Industry in India, this study was focused on a select group of Composite and Organized Textile Industry players in India, having substantial revenue from Exports.

A manufacturing firm is perceived to be performing well when the firm shows high Economic Efficiency. Economic Efficiency is quantified using Technical

Technical Efficiency, Export Performance, supply chain, leadership Operational Performance.

Efficiency and Allocative Efficiency. Economic Efficiency is a holistic measure of the firm's operational performance, in terms of profitability, resource utilization, people capability, etc. The textile industry exports are primarily defined by the revenue generated and the year on year growth achieved in the export business. There are several other factors like the expansion of the export portfolio in terms of market and product basket, forward integration through a distribution network in the US / Europe market, etc. However, the current study is focused on measuring the Export Performance in terms of the export revenue and export growth of the firms. This study attempts to estimate the Economic Efficiency of select Organized Composite textile firms in India and relate with their export performance.

Overview of Available Literature

The existing literature applicable to the research objectives was reviewed. Studies specific to the conceptual framework of Economic Efficiency, estimation of factors of Economic Efficiency, and Export Performance was compiled to develop a better understanding of the concepts and methodology. Several researchers have studied the financial performance of the textile industry players to evaluate Economic Efficiency, like Zala (2010), Gupta (2017), Dhanabhakyam et al (2014), Shrimali (2013) and Ambastha & Momaya (2004) to estimate Economic Efficiency through different methods. They evaluated the financial performance based on different financial indicators like financial efficiency, profitability, liquidity, solvency, return on capital employed, current ratio, net profit margin, brand strategy, Economic Value Add (EVA), Value Pyramid, Value Curve, Asset-Process-Performance (APP), etc. Some researchers like Shrimali (2013) and NPC (2009) related the firm/cluster level performance to the Export Performance of the respective firm/clusters.

Anand (2014) and Gupta (2017) analyzed the performance of select Indian textile enterprises on financial parameters of profitability, liquidity, and solvency to reveal that there is a significant difference in Return on Capital Employed, Current Ratio, Net profit margin within the select group of firms. Similarly, Zala (2010) studied the productivity and financial efficiency of select textile firms in India to evaluate their performance.

As per Investopedia (2019), Economic Efficiency can be understood as "a measure of how effectively all goods and elements of production in an economy are utilized, distributed/allocated and generation of waste is minimized". Different theoretical framework for quantification of Economic Efficiency was used by Ambastha and Momaya (2004), to quantify firm-level economic performance. The models evaluated by them include Economic Value Add (EVA), Value Pyramid, Value Curve, Asset-Process-Performance (APP), and others, which are evaluated against usage and complexity. Similar attempts were made at a cluster level by Sumathi (2015), who analyzed and compared the performance of textile firms of Coimbatore district in Tamil Nadu. The study was focused on evaluating the performance of the textile cluster. She determined the qualitative scores for the eight companies based on the analysis of performance against 25 financial ratios.

While some authors focused on financial ratios and financial evaluation of firm's performance, Economic Efficiency has been studied by several authors and found to be having two major metrics as defined by Gautam et al (2012):

"Technical Efficiency is defined as the ability to produce a given level of output with a minimum quantity inputs under certain technology and **Allocative Efficiency** refers to the ability to choose optimum input levels for given factor prices"

Studies in the area of Technical and Allocative Efficiency have happened in textile as well as other industries. Quantification of Technical Efficiency was carried out by Bhandari (2007) using non-parametric Frontier models for the Indian textile industry at a firm-level for different years starting from 1985-86 until 2001-02. He used grand frontier for all analysis of all firms and group frontier specific to firms from a state, type of ownership, or organization type. The common comparative parameter used by him to evaluate the firm's technical efficiency was the 'Technology Closeness Ratio (TCR)'.

Yot (2011) evaluated Technical efficiency parameters of Thai listed manufacturing enterprises from 2000 to 2008. He identified several factors responsible for the impact on the Mean Technical efficiency of firms, such as Trend in return of scale, Intermediate inputs, Labour inputs, Capital, Financial constraints (leverage), Liquidity, External & internal financing, Research & development, and Ownership. The study also revealed that a firm's technical efficiency predicted by the SFA approach indicated a significant and positive impact on export participation of the firm. However, the same was not statistically significant when evaluated using the DEA approach.

A similar quantification attempt was carried out by Pusnik (2010) for the firm-level data from Slovenia. He explored the relationship of Technical and Allocative efficiency with export orientation using Data Envelopment Analysis (DEA) and stochastic frontier analysis (SFA). He found that the firms which are more efficient than their competitors in the industry are more export-oriented and that technical efficiency is more significant for firms' export orientation than allocative efficiency. A comparative analysis of different methodologies being used for estimation of Economic Efficiency was carried out by Erkoc (2012). He evaluated different methodologies, with emphasis on the comparison between Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA). As per Erkoc "Whereas the superiority of SFA over to the DEA was revealed as a) including statistical noise into the frontier b) allowing statistical tests on the estimates, DEA is seen advantageous at times due to the fact that it doesn't require any specific functional form for production function and distributional form for inefficiency terms. For that reason, the trade-off between misspecification bias (in SFA) and measurement error (in DEA) determines the preference of researchers conducting efficiency analysis". A holistic view of Economic Efficiency through analysis of technical and allocative efficiency of manufacturing organization was provided by Douglas (2008). Similarly, Murillo (2004) evaluated different parametric and non-parametric frontier methods to estimate Economic Efficiency and found Stochastic Frontier Analysis valid for estimation of Economic Efficiency in the manufacturing industry. Several other authors estimated, analyzed Economic Efficiency through

different financial ratios as well as Technical Efficiency and Allocative Efficiency, as given in table 1.

Table 1 Factors and Methods used for the Estimation of Economic Efficiency

Economic Efficiency Measurement	Estimation	Author (Year)
Economic Efficiency as estimated through Technical and Allocative Efficiency	Technical Efficiency using Stochastic Frontier Analysis (SFA)	Dhiman and Sharma (2017), Gupta (2017), Anand (2014), Dhange (2013), Erkoc (2012), Jakhar et al (2012), Yot (2011), Pusnik (2010), Saxena (2010), Sorri (2010), Saxena (2010), Douglas (2008), Bedi and Cororaton (2008), Berdine et al (2008), Allen (2008), Bhandari (2007), Graner (2007), Taplin (2006), Bruce (2004), Murillo (2004)
	Allocative Efficiency using labor productivity, material productivity analysis	Dhiman and Sharma (2017), Dhange (2013), Yot (2011), Saxena (2010), Sorri (2010), Zala (2010), Saxena (2010), Douglas (2008), Bedi and Cororaton (2008), Bhandari (2007), Graner (2007), Taplin (2006),
Economic Efficiency Estimation through other Financial Methodologies	Economic Value Add (EVA), Value Pyramid, Value Curve, Asset-Process-Performance (APP)	Gupta (2017), Bosloper et al (2006), Anand (2014), Dhanabhakyam et al (2014), Dhange (2013), Kazmi and Naarananoja (2013), Bloom et al (2013), Afzal (2012), Saxena (2010), Kapelko (2009), Berdine et al (2008), Bruce (2004), Maurice (2008), Allen (2008), Momaya (1998)

Several researchers largely submerge on Technical Efficiency and Allocative Efficiency as the major contributors for estimation of Economic Efficiency. Studies have inferred that Stochastic Frontier Analysis (SFA) to more appropriate as against Data Envelopment Analysis (DEA) for determining the Technical Efficiency of manufacturing firms for estimation of Economic Efficiency.

Research Objectives:

This study attempts to estimate the Economic Efficiency of select Organized Composite textile firms in India and relate with their export performance considering the following objectives

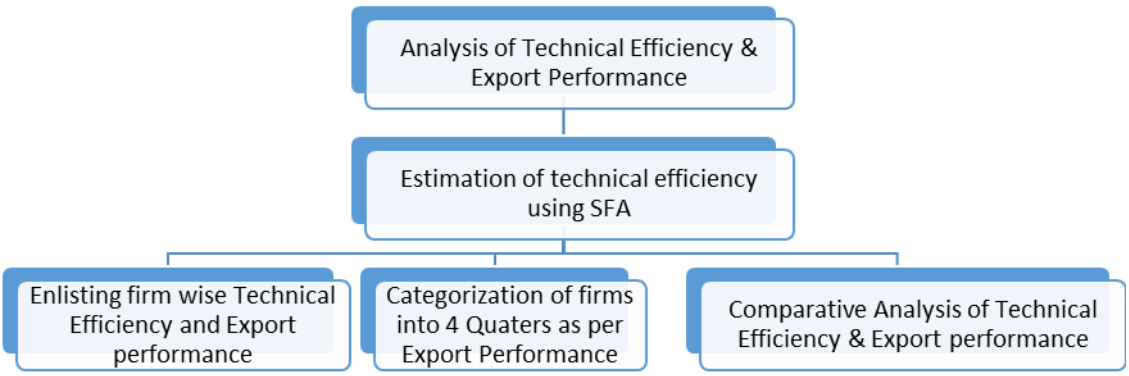
1. To evaluate Economic Efficiency of a select group of firms from Organized Composite Textile Industry in India, as measured using Stochastic Frontier Analysis (SFA)

2. To explore the relationship between the Economic Efficiency and Export Performance within a select group of firms from the Organized Composite Textile Industry in India.

Research and Analysis Design

The segment of the textile industry in India selected for the study constitutes firms with financial performance information available in the public domain. The concepts being evaluated in the current study are Economic Efficiency and Export Performance. The research process was derived from the process followed by Yot (2011) for the Estimation of Technical Efficiency and Evaluation of the relationship between Technical Efficiency and Export Performance for the Organized Composite Textile Industry in India. The analysis structure used is given in figure 1.

Figure 1 – Analysis Structure



Secondary data analysis was carried out for the estimation of Technical Efficiency. Technical Efficiency is a measure of effective utilization of the firm's assets/equipment to generate revenue for the firm. Variables and the factors are tabulated below.

Table 2 – Variable and Factors for Analysis

Variable Name	Factor Name
Technical Efficiency	Revenue of the Firm
	Material Spend
	Manpower Spend
	Capital value
Export Performance	Export Revenue as % of Total Revenue
	Export Growth % for the period of 2013-14 to 2017-18

The secondary data was obtained from respective firm websites and internet sources. Data from the respective firms' website was downloaded to evaluate the Technical Efficiency of the select firms from the Organized Composite Textile industry in India. Frontier 4.1 software program was used as described by Coelli (1996), and defined by the Stochastic Production Function is given below:

$Y_i = x_i\beta + (V_i - U_i)$,i = 1,2,,….N

Where Y_i = production (or the logarithm of the production) of the ith firm;

x_i is a k x 1 vector of (transformation of the) input quantities of the i-th firm;

β is a vector of unknown parameters;

V_i are random variables that are assumed to be iid. $N(0,\sigma_V^2)$, and independent of the

U_i which are non-negative random variables that are assumed to account for technical inefficiency in production and are often assumed to be iid. $N|0,\sigma_U^2|$

Revenue from operations was used for the respective firms as dependent variable (Y) and Material spend, Manpower Costs & Capital Employed as independent variables to be used in the Frontier 4.1 program.

Sampling Plan and Sample Size

Details of listed entities in the segment of the Organized Composite Textile industry were downloaded from the Capitaline database (2018). All companies with annual revenue greater than INR 500 Cr in the Financial year 2018 were chosen for the analysis. A sample of 52 firms was taken for the estimation of Technical Efficiency and further analysis for the relationship between Technical Efficiency and Export Performance.

Data collection for the selected firms from Organized Composite Textile Industry in India was carried out from the respective firm's website and other sources like moneycontrol.com. While the total revenue, material spends, labor spends were available in the Profit & Loss statements of the firm, the data for export revenue and capital cost was obtained from the respective firm's annual reports. Data for five financial years, starting from 2013-14 to 2017-18 was collected and compiled for further analysis. Export Growth was computed for 5 years, by comparing Export revenue of 2013-14 with Export revenue of 2017-18 for individual firms. The coding structure used for the analysis of demographics is given in the table below.

Table 3 Codification of Data

Variable	Coding
Size of the Firm	Large – H, Medium = M, Small = S
Region Represented by the Firm	North=N, East=E, West=W, South=S

Stochastic Frontier Analysis (SFA) was carried out to quantify production frontier Technical Efficiency for evaluation of relationship within Technical Efficiency & Export Performance of select firms from the Organized Composite Textile industry in India. SFA was used since it provides more reliable results for the manufacturing

industry (Yot, 2011, Erkoc, 2012). Technical Efficiency estimated through SFA and Export Performance from the public domain data for select firms was compared using quantitative analysis.

Analysis and Discussion

Technical Efficiency for the Organized Composite Textile industries was evaluated using the Stochastic Frontier Analysis (SFA). The data for 52 sample firms for 5 years was fed to the Frontier 4.1 program, to derive Technical Efficiency. Average Technical Efficiency for the firms representing different regions and of different Revenue Categories was mapped for different years. The export performance was mapped for each firm to evaluate the relationship between Technical Efficiency and Export performance. The output from Frontier 4.1 for all the 52 firms for five years, along with the respective export revenue (as % of total revenue for FY 2017-18) and Export Growth (for the period from FY 2013-14 to FY 2017-18) is tabulated in table 4. The output from Frontier 4.1 analysis in the form of Technical Efficiency of each firm for the years 2013-14 to 2017-18 is listed in table 4. The Technical Efficiency values are depicted in % terms.

The Technical Efficiency is evaluated using the production frontier function. The firm revenue for the respective year is taken as the output variable and raw material costs, people costs & capital value of the company are used as input variables. The firm which has the highest Technical Efficiency, is given Technical Efficiency value of 100%, or 1.00. Other firms are given lower than 100% values, indicating that they are incrementally inefficient as compared to the best firm. For example, firm # 2 has 100% Technical Efficiency value in the year 2013-14. Other firms have lower value than Firm # 2 for the corresponding year. Firm # 1, which has got 91.4% value, can be considered as 8.6% inefficient as compared with firm # 2.

Table 4 Technical Efficiency and Export Performance for Select 52 firms from Organized Composite Textile Industry in India

Firm #	Region	Rev Cat	Technical Efficiency from Frontier 4.1					% Exports Growth (since FY2014)	% export Revenue (FY2018)
			2013-14	2014-15	2015-16	2016-17	2017-18		
1	W	L	91.4%	89.9%	87.7%	84.3%	92.5%	98.0%	95.0%
2	N	H	**100.0%**	93.2%	96.7%	90.5%	80.7%	45.7%	90.6%
3	W	H	97.1%	84.2%	90.7%	95.7%	89.5%	95.0%	90.0%
4	W	M	77.1%	82.9%	**100.0%**	**100.0%**	92.7%	18.2%	87.8%
5	S	M	91.1%	88.5%	94.9%	98.4%	**100.0%**	87.8%	85.3%
6	S	M	93.5%	**100.0%**	95.9%	97.0%	96.6%	35.8%	84.4%
7	S	L	76.5%	74.1%	73.0%	74.0%	78.3%	80.3%	76.1%
8	W	H	77.8%	70.0%	62.8%	62.2%	59.8%	75.5%	76.0%
9	N	M	89.6%	79.7%	98.5%	93.7%	91.2%	-47.2%	59.3%
10	N	L	70.2%	67.2%	67.0%	66.9%	63.6%	96.9%	55.0%
11	N	M	69.8%	68.7%	67.8%	70.6%	67.0%	30.1%	54.2%
12	N	H	68.4%	68.5%	65.8%	71.3%	67.4%	83.1%	50.8%
13	N	H	72.6%	67.3%	76.9%	81.9%	73.8%	-53.3%	48.0%
14	S	M	71.0%	67.7%	71.5%	70.5%	71.1%	30.0%	48.0%
15	N	L	69.0%	70.1%	66.4%	63.1%	59.8%	21.0%	47.9%
16	N	M	72.8%	84.8%	85.1%	82.3%	91.1%	95.0%	44.0%
17	W	H	73.1%	71.1%	71.3%	68.2%	63.5%	27.7%	44.0%
18	N	L	71.2%	71.1%	69.3%	67.8%	62.3%	25.1%	37.8%
19	N	L	67.0%	63.8%	65.1%	62.1%	60.3%	29.0%	36.7%
20	N	L	66.6%	69.7%	71.6%	71.4%	71.2%	-72.9%	34.1%
21	N	H	66.1%	68.0%	70.9%	68.1%	61.2%	-22.9%	34.0%
22	N	M	67.0%	81.0%	81.8%	77.1%	67.3%	12.0%	32.8%
23	W	L	67.0%	64.6%	62.7%	66.4%	67.3%	12.0%	31.8%
24	S	H	66.3%	65.1%	64.7%	60.9%	59.4%	11.0%	30.8%
25	W	H	67.7%	65.4%	63.6%	68.0%	72.7%	10.1%	29.5%
26	N	L	68.1%	61.1%	62.2%	62.1%	60.4%	-3.6%	26.7%
27	W	H	61.9%	63.5%	62.1%	63.3%	62.5%	10.0%	24.0%
28	W	H	63.8%	61.8%	64.4%	62.2%	58.1%	9.4%	23.0%
29	W	H	62.4%	68.2%	75.4%	70.3%	67.3%	9.0%	22.4%
30	S	H	63.2%	60.4%	60.1%	57.8%	57.7%	5.9%	20.9%
31	W	H	65.2%	65.3%	70.5%	65.4%	57.0%	5.5%	19.4%
32	N	H	64.3%	65.7%	68.3%	68.2%	66.8%	4.6%	19.3%
33	N	M	63.4%	62.7%	63.5%	60.8%	58.8%	2.0%	19.2%
34	N	H	66.1%	66.5%	63.7%	62.5%	58.2%	0.6%	18.1%
35	E	L	64.8%	70.8%	68.4%	73.8%	73.6%	0.5%	17.7%
36	W	M	64.8%	66.8%	60.0%	58.9%	56.5%	-2.5%	16.3%
37	W	L	60.8%	60.7%	61.2%	61.4%	60.0%	10.0%	10.8%
38	W	L	61.6%	63.6%	65.0%	60.7%	63.8%	-5.8%	10.4%
39	N	H	61.5%	61.7%	62.9%	57.6%	60.1%	-8.0%	9.4%
40	E	M	59.6%	70.3%	71.7%	68.0%	65.0%	-10.8%	9.1%
41	W	M	60.6%	61.3%	62.6%	57.7%	58.2%	-11.5%	8.8%
42	N	L	61.1%	60.1%	60.5%	60.2%	59.8%	-16.2%	8.8%
43	W	L	59.6%	60.0%	60.1%	58.5%	100.0%	28.9%	8.7%
44	E	L	60.1%	63.2%	69.2%	64.9%	61.6%	-37.3%	6.8%
45	W	H	60.6%	61.9%	59.8%	60.0%	58.6%	-43.8%	6.5%
46	W	H	58.9%	60.5%	61.0%	59.8%	61.4%	51.8%	6.1%
47	W	M	57.4%	57.4%	62.9%	57.6%	62.2%	-49.7%	4.4%
48	E	H	56.5%	60.5%	60.6%	58.0%	64.4%	-51.6%	4.2%
49	E	L	54.3%	54.4%	55.7%	55.5%	62.5%	42.0%	2.0%
50	E	M	53.7%	54.5%	54.0%	51.0%	50.5%	-58.2%	1.6%
51	S	L	53.3%	52.0%	56.3%	54.2%	50.9%	-67.4%	0.6%
52	S	L	52.4%	56.3%	62.8%	52.0%	64.8%	20.7%	0.4%

The firms have been arranged in descending order of the export revenue performance in the table 4. All the firms have been categorized into four quarters of 13 firms each based on the export revenue as % of the total revenue of the firm. Top quarter firms have the highest export revenue as % of total revenue, while the bottom quarter is represented by the firms having lower export revenue as % of the total revenue of the firm. The table also lists export growth for each firm during the period 2013-14 to 2017-18.

Technical Efficiency of the sample firms representing different regions, as well as of different Revenue Categories were analyzed further. The firms selected for analysis were sub-divided into different revenue categories and regions represented by the firms. The average Technical Efficiency was classified over the five-year period for all the firms as per size and regions, which is tabulated in Tables 5 and 6 respectively.

Table 5 Year-wise Technical Efficiency Performance as per the Size of the Firms

Size of The Firm	2013-14	2014-15	2015-16	2016-17	2017-18
Large	68.7%	67.4%	68.6%	67.6%	65.0%
Medium	70.8%	73.3%	76.4%	74.5%	73.4%
Small	65.3%	65.1%	65.8%	64.4%	67.4%
Total	68.1%	68.2%	69.7%	68.4%	68.1%

Table 6 Year-wise Technical Efficiency Performance as per the Region represented by the firms

Region	2013-14	2014-15	2015-16	2016-17	2017-18
North	70.2%	70.0%	71.8%	70.4%	67.4%
East	58.2%	62.3%	63.3%	61.9%	62.9%
West	67.8%	67.3%	68.6%	67.4%	68.6%
South	70.9%	70.5%	72.4%	70.6%	72.4%
Total	68.1%	68.2%	69.7%	68.4%	68.1%

The performance of firms as per size and regions indicates that medium-size firms have better Technical Efficiency as compared to other revenue categories. Similarly, North and South region firms have better Technical Efficiency compared to firms from other regions.

Relationship between Technical Efficiency and Export Performance

The results from the analysis are tabulated in Table 4 were used to explore the relationship between Technical Efficiency and Export Performance of the Organized Composite Textile Industry in India. Categorization based on descending order of Export Revenue into four quarters of 13 firms each and derivation of the relationship is explained herewith. The quarter wise Technical Efficiency of firms was compared with the Export performance. The analysis of Quarter-wise Technical Efficiency and Export Performance is compiled in Table 7.

Quarter 1 represents the 25% of firms with higher Export performance. It can be clearly observed that the quarter 1 firms have higher Technical Efficiency as compared with firms from other quarters. Quarter 1 firms have average Technical Efficiency of 81.9%, as against the average Technical Efficiency of Quarter 2 (68.6%), Quarter 3 (63.5%), and the lowest for quarter 4 (59.9%). The firms in quarter 1 have 73.3% revenue from Exports, as compared to 5.2% for quarter 4. Similarly, the Export Growth for Quarter 1 firms is a healthy 49.7%, compared to negative growth of 15.6% for quarter 4.

Table 7 Relationship of Technical Efficiency and Export performance

Quarter	Technical Efficiency	Export Revenue %	% Export Growth	No of Firms as per Size			No of Firms as per Region			
				Large	Medium	Small	North	East	West	South
1	81.9	73.30%	49.70%	5	5	3	6		4	3
2	68.6	36.80%	13.30%	4	3	6	8		3	2
3	63.5	17.80%	3.20%	8	2	3	4	1	7	1
4	59.9	5.20%	-15.60%	3	4	6	1	5	5	2

It can be observed that the firms with a higher score of Technical Efficiency fare higher on Export Performance. Also, the firms with lower Technical Efficiency have lower Export Performance for the select sample and the period the data was analyzed. Similar findings were obtained by Yot (2011) during a study for Thai listed companies using SFA to estimate Technical Efficiency.

Distribution of large, medium, and small firms across the four quarters defined as per Export Performance was further analyzed. It can be observed from Table 7 that the different size firms have been distributed in all the quarters. Large, medium as well as small firms appear in all the quarters. It can be inferred, therefore, that the Export Performance of the firm is not dependent on the size of the firm. This can be explained by the legacy of the Indian textile industry, which is highly fragmented, diversified and focused on specialized expertise. The industry players have developed a niche category for themselves and being able to excel, irrespective of the size of the firms.

However, the analysis for regions represented by the firms in different quarters revealed different outcomes. Referring to Table 7, the firms from the East region are predominantly appearing in the bottom two quarters. North region firms have a large presence in the top two quarters (14 out of 19 in the top two quarters). West region firms are distributed across all quarters, however, 12 out of 19 firms appear in the bottom 2 quarters. And South firms appear in all quarters. Textile industry in India and the exports from India have grown during the last two decades, through the development of export promotion zones and investments primarily in the

North and West regions. There have been relatively low investments in the Eastern region, resulting in challenges in coping with new technology and expectations from the international market. This may have resulted in the Eastern region firms depicting the lower performance of Technical Efficiency as well as Export performance.

Conclusions

Comparative analysis of Technical Efficiency as measured using SFA and the Export Performance of the select group of firms from Organized Composite Textile industry in India was carried out. Inferences based on the analysis outcome are given below.

- Firms with higher Technical Efficiency fare higher on Export Revenue as % of the total revenue of the firm. Moreover, the firms with a higher score of Technical Efficiency have shown higher Growth in Export Revenue. On the other hand, firms with lower Technical Efficiency show lower performance on Exports, both on Export Revenue and Growth in Export Revenue.
- The size of the firms does not have a significant impact on either Technical Efficiency or Export Performance. This clearly substantiates the diversified nature of Indian industries, where small, medium, and large enterprises can perform at par with each other.
- There was a distinct difference in the Technical Efficiency and Export Performance of firms from the North region as against the East region. A significant number of firms from the North region show higher Technical Efficiency and Export Performance, whereas most of the firms from East Region lie on lower quarters of Technical Efficiency and Export Performance.
- It can be inferred that Textile Exporters from India need to focus on Operational Performance (Technical Efficiency, as measured in this study) to improve Export Performance.

References

Afzal, Hafiz Muhammad Yaseen (2012), Impact of Electricity Crisis and Interest Rate on Textile Industry of Pakistan, *Academy of Contemporary Research Journal*, vol 1 #1, pp 32-35

Allen, Ronald Maurice (2008), Performance Measurement of Textile and Apparel Supply Chains in Developing Countries, *A Dissertation Submitted to the Graduate Faculty of North Carolina State University in the partial fulfillment of the requirement for the Degree of Doctor of Philosophy, North Carolina*

Ambastha, Ajitabh and Dr. Momaya, K (2004), Competitiveness of Firms: Review of Theory, Frameworks, and Models, *Singapore Management Review*, volume 26, #1, pp 45-62

Anand, Meenakshi (2014), A study of Financial Analysis in Textile Sector, *Journal of Business Management & Social Sciences Research*, Vol 3 No 6, June 2014

Bedi, Dr. Jatinder S et al (2009), Assessing the prospects for India's Textile and Clothing sector, *National Council of Applied Economic Research,* (July) Report submitted to Ministry of Textile, Government of India

Bedi, Jatinder S, Cororaton, Caesar B (2008), Cotton-Textile-Apparel Sectors of India: Situations and Challenges Faced, *International Food Policy Research Institute (IFPRI) Discussion paper* 00801 (September)

Berdine, Matt, Parrish Erin, Cassil Nancy L, Oxenham, William (2008), Measuring the Competitive Advantage of the US Textile and Apparel Industry, *Alfred P Sloan Foundation Industry Studies, Annual Conference*, Boston MA (May 1-2)

Bhandari, Anup Kumar, and Ray, Subhash C (2007), Technical Efficiency in the Indian Textile Industry: A Non-parametric Analysis of Firm-Level Data, *University of Connecticut, Economics Working Paper* (November)

Bhandari, A. K. and P. Maiti (2007), "Efficiency of Indian Manufacturing Firms: Textile Industry as a Case Study", *International Journal of Business and Economics*, 6 (1), 71-88.

Bloom N, Eifert B, Mahajan A, Mckenzie D, Roberts J (2013), Does Management Matters? Evidence from India, *The Quarterly Journal of Economics*, Vol 128 # 1 (Feb)

Bosloper, Michael J et al (2006), Economic Conditions and How It Effects Trade between the U.S. And India, *International Business and Economics Journal*, Vol 5 #3 (March)

Bruce, Margaret (2004), Lean or agile: A solution for supply chain management in the textiles and clothing industry, *International Journal of Operations & Production Management*, Vol. 24 #2 pp 151-170

Capitaline database, website accessed on 27 Jan 2018

Dhanabhakyam, Dr. M and Latha, M, Indian Textile Industry: Brand Strategy and Export competitiveness, *Fiber to Fashion*, www.fibre2fashion.com, accessed on 27 Jan 2014

Dhange, Vaibhav (2013), Techno-Economic Efficiency in the apparel industry, *International Journal of Fiber & Textile Research*, 3(3): 60-62

Dhiman, Rahul and Sharma, Manoj (2015), Determinants Affecting Indian Textile Exports: *A Review, Biz, and Bytes* (Vol. 6. Issue: 2), pp195-201

Dhiman, Rahul and Sharma, Manoj (2017), Productivity Trends and Determinants of Indian Textile Industry: A Disaggregated Analysis, *International Journal of Applied Business and Economic Research*, Volume 15, Number 22 (Part 2) pp 113-124

Douglas, Kibirige (2008), Analysis of the impact of the agricultural productivity enhancement program on the technical and allocative efficiency of Maize farmers in Masandi district, *Makerere University, Kampala, Uganda* (Sept)

Erkoc, Taptuk Emre (2012), Estimation Methodology of Economic Efficiency: Stochastic Frontier Analysis vs Data Envelopment Analysis, *International Journal of Academic Research in Economics and Management Sciences*, Vol. 1, No. 1 (Jan)

Gautam, Madhur, Nagarajan, Hari K, Pradhan, Kailash C (2012), Technical, economic and allocative efficiency and its determinants of Indian agricultural farmers using ARIS/REDS panel data, *NCAER Working Papers on Decentralization and Rural Governance in India*, # 16 (Nov)

Graner, Mats and Isakson, Anders (2007), Firm efficiency and the destination of exports: Evidence from Kenyan plant-level data, *Research and Statistics Branch, United Nations Industrial Development Organization*, Staff working paper (March)

Gupta, Varsha (2017), A Study of Performance Evaluation of Select Textile Industries An Empirical Analysis, *IOSR Journal of Business and Management*, Vol 19 Issue 1 Ver III Jan 2017 pp 54-58

Jakhar, S K and Barua, Dr. M K (2012), Performance Measures for the textile-apparel supply chain, *National Conference on Emerging Challenges for Sustainable Business*, pp 1812-1822

Kapelko, Magdelena (2009), Intangible Assets and firm efficiency, International analysis in the textile and apparel industry, *Autonomous University of Barcelona*, Ph.D. Dissertation (March)

Kazmi, A Asiya Z and Naaranoja (2013), Competitiveness of Pakistan's Textile sector to re-install its global outreach – A suggestive analysis, *International Journal of Advanced Business and Management Research*, Vol. 1, Issue. 1, pp. 63-71

Ministry of Finance (2018), Annual Report, April 2018, *Department of Economic Affairs, Economic Division*, 4(3)/Ec./Dn./2012

Ministry of Textiles, Government of India, International Cost Comparison for Textile products, updated as on 20 Sept 2012, *http://texmin.nic.in/ermiu/intcost.pdf*, website accessed on 5 Feb 2014

Ministry of Textiles, Government of India, Overview of Textile Industry (2018), *http://texmin.nic.in/ermiu/texind.pdf* , website accessed on 10 May 2019

Ministry of Textiles, Government of India, Results-Framework Document (RFD) for Ministry of Textiles (2013-14), *http://texmin.nic.in/aboutus/rfd/RFD-2013-14%20(CORRECTED)%2021.10.13.pdf*, website accessed on 5 Feb 2014

Momaya, K (1998), Evaluating International Competitiveness at the Industry Level, *Vikalpa*, Vol. 23 # 2 (April-June)

Moneycontrol.com (2013), financial performance reports of top 14 listed textile companies

Murillo-Zamorano, Luis R (2004), Economic Efficiency and Frontier Techniques, *University of York and University of Extremadura, Journal of Economic Surveys*, Vol 18, No 1

Olsen, Wendy (2004), Triangulation in Social Research: Qualitative and Quantitative Methods Can Really by Mixed, *Development in Sociology, Causeway Press (2004 ed.)*

Pusnik, Ksenja (2010), From technical and cost efficiency: Firm-level data from Slovenia, *Economic and Business Review*, Vol 12 # 1 pp 1-28

Saxena, Dr. Sancheta Banerjee (2010), Competitiveness in the Garment and Textile Industry: Creating a Supportive Environment – A case study of Bangladesh, *The Asia Foundation, Occasional paper no. 1* (July)

Shrimali, Dr. Devendra (2013), Performance of Indian Textile and Clothing Industry in the US Market – A Post ATC analysis, *Abhinav, A national monthly referred journal of research in commerce and management*, vol 2 # 3 pp 64-76

Sorri, Rahel (2010), Performance Measurement and Improvement of Ethiopian Garment Industries, *Adis Ababa University, Faculty of Technology, School of Graduate Studies, Department of Mechanical Engineering* (August)

Sumathi, N (2015), Performance Analysis of Select Textile Mills in Coimbatore District, *Journal of Progressive Research in Social Sciences (JPRSS)*, Vol 2, # 1 (June)

Taplin, Ian N (2006), Restructuring and Reconfiguration: The EU Textile and Clothing Industry Adopts to Change, *European Business Review*, Vol 18 # 3, pp 172-186

Technopak Study Report (2018), Global and Indian T&A Sector and the Opportunities in the Domestic Market (July)

Wazir Advisors (2017), Annual Report on Indian Textile and Apparel Industry, *Wazir Advisors Publication (Dec)*

World Bank statistics (2018), *http://data.worldbank.org/country/india*, website accessed on 11 Feb 2018

Yot, Amornkitvikai (2011), Technical Efficiency Performance of Thai Listed Manufacturing Enterprises, *A Dissertation submitted to University of Wollongong*