

COST EFFICIENCY ANALYSIS OF SOCCER BALL PRODUCING FIRMS IN SIALKOT, PAKISTAN

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ABSTRACT: *Sports have always been considered an important part of the society, but now, these are becoming an increasingly important part of the economy of all the nations. Soccer ball is arguably the most favorite game of the world, which has seen its 20 world cups. Pakistani soccer ball producing firms are well known for their high quality products. Accordingly, this research paper assessed the performance of five soccer ball producing firms in district Sialkot Pakistan. For this purpose, we applied linear programming based technique Data Envelopment Analysis (DEA) in order to obtain the technical and cost efficiency scores. The secondary data of five years have been taken from annual auditing reports of Nasir & Company. Suitable input and output variables are selected to calculate the technical and cost efficiency scores. The results allow finding the relative efficiency of soccer ball producing firms during last five years. This is a pioneering study of its kind and very helpful in improving the policy of the sports sector of Pakistan.*

Key Words: Technical Efficiency, Cost Efficiency, DEA, VRS, CRS, Sports, Soccer Ball

INTRODUCTION:

The sports play a very important role in the economic development of any country. Sports have always been considered as an important part of the society, but now, these are becoming an increasingly important part of the economy of all the nations. So, the measurement of the impact of the sports on the economy is becoming an interesting topic for the economists. Football is almost the most favorite game of the world, which has seen its 20 world cups, out of which, the last has just ended in Brazil. This paper evaluates the performance of the sports firms. To do this, first of all we analyze the impact of these mega events on the economies of the host countries. There are different views of the economists, that apart from national prestige, there are many concrete economic benefits of hosting the world cups. The evidences, in this regard, are mixed. Some studies suggest that World Cup results in large gains in employment and a boost to the economic activities is the direct result for the hosting country, while some differ strongly. After assessing the impacts of the FIFA world cups on the hosting country, now we move on to the sports industry of Sialkot & performance of soccer ball producing firms of Sialkot. The official ball used for all the matches in the FIFA world cup 2014 was produced by a firm of Sialkot, Pakistan. Sialkot is known as the hub of the sports goods all over the world. Cricket, hockey, football, martial arts, swimming, motorbike & car racing apparel, leather wears, musical instruments, sports wears, are the main sports industries of Sialkot. Besides above mentioned industries, there are many small industries related to the sports, which do not count much for the whole lot. Our main concern is the football industry of Sialkot. There was a time when 80% football of the world was produced in Sialkot. But due to the negligence of the successive governments, the industry kept shrinking and had to bear losses for government. Again in 2014, the FIFA ordered the official footballs of the tournament to a firm of Sialkot, and again Sialkot became the hub for the football industry. According to a report of PakistanToday.com.pk, 42 million footballs were exported from Sialkot to the foreign countries. In 1982 FIFA world cup, Sialkot also gained the

international reputation when it produced “Tango Ball” used in the FIFA world cup of 1982, held in Spain, which led to further growth of soccer ball industry in Sialkot. According to the Wikipedia.org, “The Per Capita Income of Sialkot in 2012 is \$2800, which was \$2400 in 2010 and \$2100 in 2008. Sialkot is the fourth largest economic hub in Punjab after Lahore, Faisalabad and Gujranwala. It is commercially linked to the Lahore Stock Exchange through its Sialkot branch, known as the Sialkot Trading Floor (STF). The State Bank of Pakistan and the Export Promotion Bureau of Pakistan has branch offices in Sialkot. After Karachi, Sialkot is Pakistan's second largest source of foreign exchange earnings through its exports. For the past several decades, the manufacturers and exporters of the city have been awarded the annual National Exports Award by the Federation of Pakistan Chambers of Commerce and Industry. Sialkot has an Industrial Estate and an Export Processing Zone. Another Export Processing Zone is planned along the Sialkot Lahore Motorway. The per capita income of Sialkot is ranked among the highest in Pakistan.”

“All over the world, football is regarded as the most popular sport. Soccer Balls; which are the main inputs for this, in 2008, it had a sale of \$1.15 billion. According to Nadvi, there is a significant increase of 240% in the trade of the football industry from year 2001 to 2008. Various tournaments and live coverage of footballs have surged the popularity of this game. However, a few brands are dominating in international market such as Nike, Adidas, Puma, and some other brands. Out of these, Nike and Adidas are the major rulers of market. Adidas has 34% market share and gets sale of \$1.57 billion from footballs related products-while Nike has \$1.7 billion sale in international market. Both, Nike and Adidas are also two biggest buyers of footballs Nadvi, 2010. The brands who have dominance in football market, actually they are not producers. They get footballs from various developing countries due to low cost of production. China, Pakistan, and Thailand are the major hubs for this and jointly contribute 70% of total export of footballs. Nevertheless, it is evident from the last four to five years, that China is increasing its dominance. China that was having 28.9% market share in

2004 has raised share up to 50.5% in 2009. While, there is a substantial decline in the market share of Pakistan. In 2009, Pakistan has just 13.2% as compared to 23% in 2006.

There are more than ten thousand registered firms working in the city. Among them three industries are dominant, i.e. of leather goods, surgical goods and sports goods. Sports Goods exported from Sialkot are famous all over the world for their quality, based on impeccable craftsmanship. Total exports of sports goods from Sialkot were amounted US \$ 76,189 thousands in 2008-09, and its share in the total exports was 1.46% [19]. The cluster supplies most of the leading branded Merchandisers in global sports goods industry – including Nike, Adidas/Reebok, Umbro, Pentland (Mitre), Puma, Decathlon, Select, and Mikasa. The total exports of soccer balls from the cluster came to US\$146 million in 2005-06 [19].

The above statistics show that the soccer industry of Sialkot is providing employment to a large number of raw handed workers & precious foreign exchange to the government of Pakistan. This industry is also responsible for feeding the associated industries, through the multiplier effect. To the best of our knowledge, there were 135 manufacturing firms producing soccer balls in Sialkot as of November 2011 [19]. The firms themselves employ approximately 12,000 workers, and outsourced employment of stitches in stitching centers and households is generally estimated to be more than twice that number.

2 LITRATURE REVIEW:

A large number of studies have been conducted with technical efficiency of the football league and sports producing firms in the world. Authors [1] assessed the technical efficiency of 49 manufacturing firms in Pakistan. The variables (4 inputs and 2 outputs) have been selected. DEA has been applied to evaluate the performance of manufacturing firms in Pakistan. The Inputs oriented approach was applied. Consequently, most firms were found inefficient and could reduce inputs to achieve given level of output. The authors [2] applied non-parametric DEA to estimate the technical efficiency of life insurance firms in Pakistan. Variables (4 inputs and 2 outputs) and 5 years data was used for calculating the technical efficiency of non life insurance firms in Pakistan. The Study found that all firms were inefficient under technical, pure and scale efficiency change. This study calculated results that large size non life insurance firms found more efficient while medium size firms less efficient. But small size firms poorest.

Authors [3] assessed the technical efficiency of electricity generating plants by using non-parametric technique. Suitable variables and panel data set were used. The results exhibit that some private and public firms were found high efficiency scores. However, public ownership had a negative impact on technical efficiency. There were found fully efficient only two private and public plants managerially. The mean efficiency was found 78%, while 8% growth occurred during the 5 years. Authors [4] observed the technical efficiency of football clubs in two small countries of European Union, Portugal & Greece using DEA non-parametric approach. The results found that the football clubs of the small European countries were threatened by the larger clubs of the large EU countries. Still, the European small countries were lagging

behind the larger European countries & this was affecting the efficiency as well as the earnings of the smaller European countries.

The authors [5] applied the DEA technique to estimate the technical efficiency of the football league. They claim that the sports efficiency of the football clubs depends on the human capital, like, players, coaches etc. & staff cost. Many large football clubs which took leading positions in the national championship that were found economically inefficient because of providing too small return on big investments. From this point of view small clubs had a significant advantage. Sports successes result in clubs' higher situation in a national rank that allowed to participate in the international tournaments and to get access to the new markets of TV broadcasting rights, sponsors' contracts, sales of clubs' symbolic etc."

According to their views, the investors of the football clubs evaluate the attraction in the investment on the club, keeping in mind it's current and expected future wins, because there was a clear relationship between the indicators of sports & financial success. The authors [6] measured the franchise payroll efficiency of the National Football League (NFL) & Major League Baseball (MLB) between 1985 and 2000, using the DEA. The results show that there was a significant difference between the level of franchise efficiency of these two & its main reason was the difference in the financial structure of these two leagues. The DEA pointed out the inefficiencies between these two leagues. The MLB proved to be overspending because of absence of a salary cap while NFLs efficiency, improved after introducing the salary cap. In this way, MLBs payroll appeared to be very high as compared to that of NFLs. In this work, the salaries (of players & coaches) were used as inputs and on field performance of the players, including a number of victories, profit & utility are taken as the output. Author [7] analyzed the variables that show a nation football team performance. The analyzed variables were macroeconomic variables, demographic variables & cultural-sports. The results contrast the previous studies because demographic & macroeconomic variables were not significant, while cultural sport variable was significant. Number of corners, offside, shooting wide & goals were taken as inputs & the points achieved by a participant in the tournament were taken as the output. Again, the results showed a relationship among variables, taking DEA for a specific country and some other independent variable, like Per-Capita GDP, investment & government as a percentage of GDP, as macroeconomic variables, population size, as demographic variable. Dummy variables were used, like South American Football Confederation, Union of European Football Association, Confederation of African Football and the Confederation of North, Central American & Caribbean Association. The authors [8] measured the efficiency of the 48 football sports associations of the Isfahan Province, using the DEA on the basis of the championships. In the year 1990, 24 boards of men & 22 boards of women were found fully efficient. Hosting of matches, sending players to the matches, training sessions of the players & the number of sports ensured were input variables, while no. of players invited to the national team, no. of players selected for the national team, medals & acquired positions in the

country, regions, continent & the world were taken as output variables.

3 METHODOLOGY

For this study, DEA technique was applied. It is non-parametric technique because it does not require assumptions or specifications on production function. This technique was introduced by Farrell in the year 1957. DEA is a linear programming technique based on mathematics, measures the relative efficiency of different decision making units (DMUs). We assume the no. of DMUs is 's' and each DMU uses 'm' inputs and produces 'n' outputs. Suppose 's' represents one DMUk, 1 ≤ k ≤ s. There are 'm' inputs which are marked with (i = 1 ..., m), and 'n' outputs marked with Y (j = 1..., n). The efficiency is defined as ratio of output to input. The weights can be found with the help of aDEA program that maximize the efficiency of firms. DEA calculates the efficiency scores and frontier. The CCR model originated by authors [9], has led to several extensions (especially mathematical technique), Particularly the BCC model by authors [10]. The CCR and BCC models were divided into two categories, input oriented model and output oriented model. The input orientation approach seeks to minimize the usage of inputs given a fixed level of output, while the output orientation approach maximizes the level of output for a given level of inputs.

The efficiency of DMUk can be defined as follows:

for each DMU_p P = 1, 2, 3.....

$$\begin{aligned} \text{maximize} \quad E_p &= \frac{\sum_{j=1}^n u_j y_{jp}}{\sum_{k=1}^m v_k x_{kp}} \\ \text{subject to} \quad \frac{\sum_{j=1}^n u_j y_{ji}}{\sum_{k=1}^m v_k x_{ki}} &\leq 1 \quad \forall i \\ u_j, v_k &\geq 0 \quad \forall k, j \end{aligned} \tag{1}$$

Where

K = 1, 2, 3...n

J = 1, 2, 3...m

I = 1, 2, 3...N

m = the amount of output j produced by ith unit,

n= the amount of inputs k utilized by ith unit,

u= weights given to output j

v= weights given to inputs k

The CCR model assumes constant returns to scale (CRS) which means one unit input can get te fixed value of output. The BCC model assumes variable returns to scale (VRS).

3.1 Malmquist Indices of Productivity Change

The panel data used in this research work, which allows measuring the total factor productivity (TFP) change. These

indices can be decomposed into technical change and technical efficiency change. The Malmquist productivity index (MPI) can be calculated by using the DEA. TFP change can be measured by using MPI between two data sets. Following the Fare, Grosskopf, Lindgren and Roos (1998) specification of an output- based oriented MPI; it is expressed as a geometric mean of two output based Malmquist indices as given in equation (13).

$$M_0(x_{t+1}, y_{t+1}, x_t, y_t) = \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} \sqrt{\frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^{t+1}, y^{t+1})} \frac{D_0^t(x^t, y^t)}{D_0^{t+1}(x^t, y^t)}} \tag{13}$$

The term outside the bracket indicates change in the technical efficiency while inside the bracket the geometric mean of two ratios which exhibits the change in technology between two periods of time like t and t+1.

$$\text{Efficiency change} = \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)}$$

$$\text{Technical change} = \left[\frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^{t+1}, y^{t+1})} \frac{D_0^t(x^t, y^t)}{D_0^{t+1}(x^t, y^t)} \right]^{1/2}$$

x_t = input vector in a period of time t,

y_t = output vector in a period of time t

D_t = distance function at period of time t,

D_{t+1} = distance function at period of time t+1

x_{t+1} = input vector at a period of time t+1,

y_{t+1} = output vector at a period of time t+1

To measure the efficiency of soccer ball producing firms in Sialkot, the MPI has been applied. It is a technique that measures the change in technical efficiency of two periods of time t and t+1. It enables us to measure the relative productivity of the DMUs (soccer ball producing firms) at the production point (x_{t+1}, y_{t+1}) with production point (x_t, y_t). The value of MPI =1 indicates that there is no change in productivity, whereas < 1 shows the firm is in a loss position (inefficient) and MPI >1 exhibits that there is benefits or gain in productivity.

3.2 Data and Variables

For this research work, the secondary data of five years have been taken from annual auditing reports of Nasir & Company Sialkot from period 2009 to 2013. Suitable inputs and output variables have been selected to calculate the technical and cost efficiency scores. There are 3 inputs employees, raw material and plant & machinery while revenue as an output.

4 RESULTS:

This research paper focuses on evaluating the performance of 5 soccer ball producing firms in Sialkot Pakistan. DEA technique was used. The software DEAP version 2.1 has been used for estimating the productivity scores of 5 firms' period of 2009-2013.

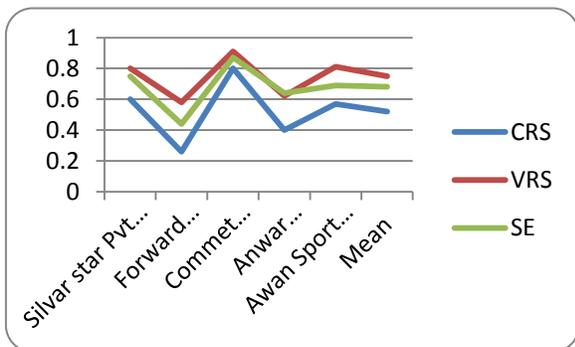
4.1 Technical Efficiency of Soccer Ball Producing Firms Averages

Table No. 1 exhibits the technical efficiency of soccer ball producing firms in Sialkot. The results indicate that none firm found fully efficient under CRS and VRS. The firms failed to

achieve maximum level of revenue. The Commet Sport Pvt Ltd is found highest efficiency score 80% that represents the best performance in generating revenue under CRS. The lowest score is found of Forward Sport Pvt Ltd (26 %), which indicates 74% firm resources (employees, raw material and plant & machinery) were not fully utilized. Under VRS, Commet Sport Pvt Ltd achieved maximum efficiency score (91%), this firm could not used 9% resources (employees, raw material and plant & machinery). Silver Star Pvt Ltd and Awan Sport Pvt Ltd are going to better perform in order to achieve maximum revenue. Commet Sport Pvt Ltd is found the highest scale efficiency score (87%) that exhibits 13% potential exist in this firm to generate revenue.

Table No. 1 Technical Efficiency of Soccer Ball Producing Firms Averages

Firms	CRS	VRS	SE
Silvar star Pvt Ltd	0.60	0.80	0.75
Forward Sport Pvt Ltd	0.26	0.58	0.44
Commet Sport Pvt Ltd	0.80	0.91	0.87
Anwar Khawaja Pvt	0.40	0.62	0.64
Awan Sport Pvt Ltd	0.57	0.81	0.69
Mean	0.52	0.75	0.68



Note: CRS = Constant Return to Scale, VRS = Variable Return to Scale, SE = Scale Efficiency Source : as per authors' calculation

Figure No. 4.1 Technical Efficiency of Soccer Ball Producing Firms Averages

2.2 Malmquist Index Annual Mean's

Table No. 2 indicates the efficiency scores of 5 soccer ball producing firms' period from 2009 to 2013 in Sialkot. The table exhibits the performance of firms under technical, technological, pure, scale and TFP changes. The highest efficiency score is found to be 812% in the year 2010, which represents the better performance of firms in Sialkot in order to achieve maximum revenue by utilizing the inputs (employees, raw material and plant & machinery). The firms are found fully efficient. Technology has been switched from labor to capital (employees to raw material). The firms could not manage their resources in the year 2010 and 2012. The firms could better utilize the resources raw material excluding employees in the both years 2010 and 2011. The highest efficiency score is found 255% in the year 2010, while the lowest efficiency score is 48% in the year 2013. The results found that expenditure are fully efficient than other factors.

Table No. 2 Malmquist Index Annual Means

Years	effch	techch	pech	sech	tfpch
2010	0.23	106.87	0.26	0.88	25.51
2011	5.43	0.36	4.26	1.27	2
2012	0.09	10.45	0.13	0.70	0.99
2013	8.12	0.06	7.52	1.07	0.48
Mean	1	2.22	1.03	0.96	2.22

Note: effch = Technical Efficiency Change, techch = Technological Efficiency Change, pech = Pure Efficiency Change, sech = Scale Efficiency Change, tfpch = Total Factor Productivity Change Source : as per authors' calculation

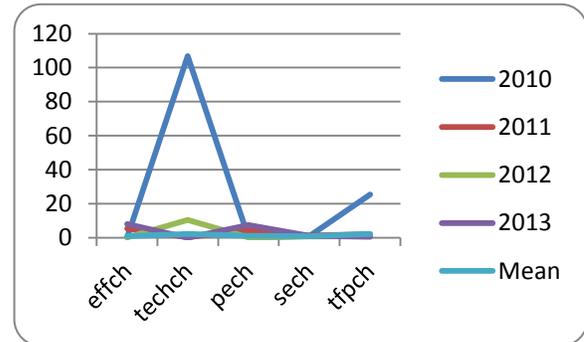


Figure No. 4.2 Malmquist Index Annual Mean's

4.3 Malmquist Index Firms

Table No. 3 exhibits the efficiencies of firms under different scales. Results represent that Silvar star Pvt Ltd, Commet Sport Pvt Ltd, and Anwar Khawaja Pvt Ltd firms are found fully efficient. Employees, raw material and plant & machinery are important resources of the firms that found fully efficient. Forward Sport Pvt Ltd and Awan Sport Pvt Ltd firms are found inefficient. All firms remained fully efficient due to technological strategy. In other words, firms switched technology from employees to plant & machinery for gaining maximum benefits in producing soccer ball. Silvar star, Anwar Khawaja and Awan Sport Pvt Ltd are found fully efficient. All firms could manage their resources employees, raw material and plant & machinery to generate revenue. There are only 2 firms Forward Sport Pvt Ltd and Anwar Khawaja Pvt Ltd that remained inefficient on scale efficiency change. All firms have positive scores on TFP change.

Table No. 3 Malmquist Index Firms

Firms	effch	techch	pech	sech	tfpch
SSPL	1.03	4.64	1	1.03	4.79
FSPL	0.82	1.77	1.05	0.78	1.46
CSPL	1.18	1.33	1.14	1.03	1.58
AKPL	1.06	1.72	1	1.06	1.83
ASPL	0.93	2.87	1	0.93	2.68
Mean	1	2.22	1.03	0.96	2.22

Note: effch = Technical Efficiency Change, techch = Technological Efficiency Change, pech = Pure Efficiency Change, sech = Scale Efficiency Change, tfpch = Total Factor

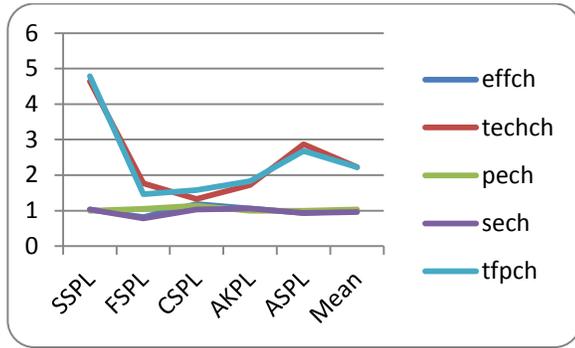


Figure No. 4.3 Malmquist Index Firms

4.4 Allocative Efficiencies Summary for the Year 2009 to 2013

Table No. 4 demonstrates the allocative efficiencies for the year 2009 to 2013. In the both year 2009 & 2010, only Silver Star Pvt Ltd is found fully efficient than other firms on AE. Similarly, Commet sport Pvt Ltd is also found fully efficient in the year 2011. In other words, the marginal cost of Commet sport Pvt Ltd is equal to its marginal product. Forward Sport Pvt Ltd is found inefficient under AE for the year 2009 to 2012. Only Commet Sport Pvt Ltd remained efficient in the year 2011 and Anwar Khawaja Pvt Ltd also remained fully efficient for the year 2012. Awan Sport Pvt Ltd is found inefficient in five years. Silvar Star Pvt Ltd remained efficient in more years relatively. Commet Sport Pvt Ltd has poor performance under AE.

Table No 4.4: Allocative Efficiencies Summary for the Year 2009 to 2013

Firms	2009	2010	2011	2012	2013
SSPL	1	1	0.74	0.64	0.94
FSPL	0.74	0.84	0.58	0.85	1
CSPL	0.96	0.58	1	0.14	0.26
AKPL	0.96	0.97	0.32	1	0.93
ASPL	0.99	0.91	0.79	0.52	0.81
Mean	0.93	0.86	0.69	0.63	0.79

Source = as per authors' calculation

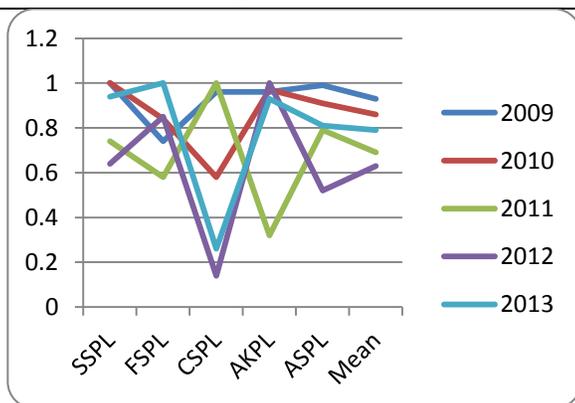


Figure No. 4.4 Allocative Efficiencies Summary for the Year 2009 to 2013

4.5 Cost Efficiencies Summary for the Year 2009 to 2013

Table No.5 represents that cost efficiency summary for the year 2009 to 2013. Silvar Star Pvt Ltd is found efficient for both years 2009 and 2010. This firm utilizes resources at minimum cost of production in order to achieve maximum output level. Awan Sport Pvt Ltd is inefficient for the years 2009 to 2013. The year 2012 shows poor performance of all firms except of Anwar Khawaja Pvt Ltd under cost efficiency. They had failed to achieve best level of output at minimum cost of production. The highest efficiency score of Awan Sport Pvt Ltd is 99 % under cost efficiency. The poorest performance of both firms Commet Sport Pvt Ltd and Awan Sport Pvt Ltd is in the years 2012.

Table No 4.5: Cost Efficiencies Summary for the Year 2009 to 2013

Firms	2009	2010	2011	2012	2013
SSPL	1	1	0	0	0
FSPL	0.71	0.1	0.58	0	1
CSPL	0.83	0	1	0	0.26
AKPL	0.51	0.06	0.32	1	0.02
ASPL	0.99	0.09	0.66	0	0.08
Mean	0.81	0.25	0.51	0.20	0.27

Source = as per authors' calculation

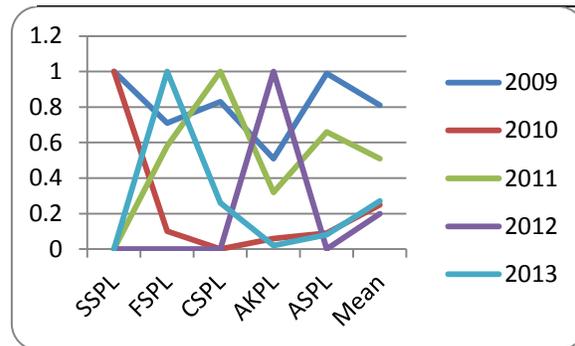


Figure No. 4.5 Cost Efficiencies Summary for the Year 2009 to 2013

5 CONCLUSIONS:

This research paper evaluates the performance of five soccer ball producing firms in Sialkot, Pakistan. This study exhibits the technical and cost efficiency analysis of firms for five years from 2009 to 2013 with secondary panel data. For this purpose the authors have used data envelopment analysis (DEA) which is a non-parametric approach based on mathematical linear programming. The results are calculated by using the DEAP version 2.1 software. Above mentioned tables show efficiencies scores of technical, technological, pure, scale, total factor productivity, allocative and cost efficiency. The results are incorporated into two categories technical and cost efficiency. Table No 4.1 shows no firm is efficient under constant returns to scale and variable return to scale. The results represent, that all firms could not ensure proper use of raw material, plant and machinery and labor. They failed to achieve maximum revenue by utilizing all inputs (raw material, plant & machinery and employees). Table No 4.2 indicates that all firms are purely efficient technically and technologically. All firms are inefficient under scale efficiency change. Table No 4.3 shows that Forward Sport Pvt Ltd and Awan Sport Pvt Ltd are technically inefficient. They should utilize the resources

properly (raw material, plant & machinery and employees) to achieve maximum revenue. Table No 4.4 exhibits the allocative efficiency of five firms. The results show that all firms are allocatively inefficient, it means that marginal product of firm is not equal to their cost of production. Table No 4.5 indicates the cost efficiency of five firms for the period 2009-13. The results represent that only Silvar Star Pvt Ltd has performed better in the year 2009 and 2010, than other firms. Awan Sport Pvt Ltd remained inefficient in five years, it needs to improve its production and cost strategy. The firms should ensure proper use of raw material in production of soccer ball to enhance the productivity and sale. Raw material must not be wasted. All firms should purchase raw material at minimum cost. The firms must plan to utilize all the inputs like raw material, plant & machinery and employees. To improve the productivity and minimize the cost of production, inputs' pairs must be made by firms. For instance, skilled labor should make proper use of plant & machinery with raw material.

Wage rate must be increased which influences the productivity of the firms. The input prices should be reduced in order to generate maximum revenue. To increase total factor productivity, all firms should utilize inputs (raw material and plant & machinery) in proper way, excluding the employees. Plant & machinery and employee pairs must be balanced so that it may avoid unemployment and wastage of resources. All firms should install more Plants & machinery in order to absorb labor. The quality of raw material should be increased.

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