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ASSESSING THE ECONOMIC EFFICIENCY OF COMPANIES IN ROMANIA IN RELATION WITH THEIR SPORT INVOLVEMENT

Abstract: *In the context of current macroeconomic and structural-functional alterations induced by the financial crisis, the present research aims at proposing an innovative method for evaluating the organizational efficiency in order to identify alternative approaches for improving corporate performance. The main research objective was to evaluate the organizational efficiency in relation with corporate involvement in sport, by considering the consumption of resources allocated by companies to this social domain. The research was developed for the top 50 companies in Romania by their turnover during 2010-2012 period and the econometric methods DEA-VRS and DEA Clustering were applied for assessing the efficiency and identifying the groups of companies with similar behaviours in terms of achieved scores and initial variables. The organizational efficiency related to sport support is fundamentally determined by the corporate variables and the macroeconomic context, and to a lesser extent by the industrial sector. In order to benefit of the advantages induced by their investments in sport, companies should optimise and strategically correlate the consumption of all their resources with the current financial reserves.*

Keywords: *sport, organizational efficiency, top 50 companies in Romania, employees, net profit, Data Envelopment Analysis (DEA), cluster analysis*

JEL classification: C38, L25, Z20

1. INTRODUCTION

The global economic changes and rough competition between corporate actors lead to the need for constant monitoring the economic performances, as well as the rational use of limited organizational resources. The evaluation of corporate efficiency is a complex issue in all economic and social areas, and its difficulty is mainly generated by using a large number of different and limited resources.

Situated at the crossroads of economic and social spheres, the sport domain is essentially based on the idea of competitiveness and performance – two concepts applied both at national and organizational level, according to the type of sport financing or the pecuniary effects brought by its promotion. Thus, on the one hand, the dependence of sport on the economic sector is based on the use of resources for sport activities, organizations and infrastructure from public or private sources, in a general context marked by economic growth and regional or national development. Alternatively, the relationship between sport and economics is also expressed in reverse, and the economic benefits generated by sport are present both at macroeconomic level, through the aggregated financial contribution of this sector to the national economic growth, and microeconomic level, through the direct and indirect advantages won by business organizations that support sport promotion for their internal or external stakeholders.

The enhancement of economic efficiency by means of sport support is an issue mainly approached from a macroeconomic view (Downward et al., 2009) and less often from a microeconomic perspective. In what concerns the second standpoint – the analysis of economic efficiency in relation with sport at organizational level – few studies dealing with sport as a resource consumer are found in the specialized literature, and the existent studies mainly focus on the economic advantages and influence of sport on corporate competitiveness. Moreover, the majority of the researches deal with professional sport and they frequently emphasize the economic results achieved by famous sport organizations or associations (Downward et al., 2009; Douvis and Pestana Barros, 2008; Guzmán, 2006). Nevertheless, most of the studies ignore or only briefly mention the economic impact of sport on business organizations that are not acting in the sporting arena, but that are very active in promoting and supporting different types of physical activities for their internal and external stakeholders. Highlighting the factors of economic growth and organizational efficiency – including the comprehensive corporate appraisal of sport as a strategic issue – is a priority in the present economic and social setting, which is marked by profound ideological and structural changes.

Considering the above issues, the present statistical and mathematical study complements the empirical research developed by Munteanu (2015) and it offers an innovative and useful perspective at national and international level regarding the evaluation of corporate efficiency related to the consumption of resources dedicated by companies to sport support. Therefore, *the main objective of the study* is to analyse and evaluate the corporate efficiency in relation with organizational involvement in sport, using the top performing companies in Romania by their turnover for the 2010-2012 period. The investigation contributes to the field of assessing corporate efficiency and the object of the analysis is represented by interpreting sport in terms of resource consumption for companies that do not exercise their business activities in the sport domain, but support sport promotion and development through various means.

The research questions tackle with: stressing the impact of sport-related resource consumption on organizational efficiency; improving efficiency through corporate sport support; identifying types of companies likely to invest in sport; assessing the influence of sport involvement on corporate efficiency in relation with the industrial sector.

In the next sections, the paper is structured as follows: literature review regarding the evaluation of organizational efficiency in relation with sport support in companies and analytical considerations about assessing economic efficiency through Data Envelopment Analysis (DEA) method; exposure of data and research methodology (DEA-VRS and DEA Clustering), as well as the reasons for choosing them; presentation and interpretation of achieved results for 2010-2012 period; and delineation of a specific set of conclusions, recommendations and further research directions, given that the present study is a pioneer in its research field.

2. LITERATURE REVIEW

2.1. Sport and organizational efficiency

The purpose of our research is to analyse the economic efficiency of firms by considering their involvement in sport support. Two main action lines are targeted for corporate involvement in sport: at internal level, through performance management and human resource policies – sport support and offering of sport incentives for employees and managers; at external level, through corporate social responsibility (CSR) policies – sport promotion and funding in the form of donations and sponsorships dedicated to sport objectives, organizations and events in the community where the business activities are carried on. There are no similar studies in the scientific literature regarding the efficiency evaluation in relation with sport-dedicated consumption of resources as one of the factors actively influencing corporate efficiency and competitiveness, but there are papers treating separately the organizational benefits induced by corporate involvement in sport.

Analysing the existent literature, Cousens et al. (2006) identify the benefits for sport sponsor-companies, with a special focus on the competitive advantages induced by strategic partnerships between business and sport organizations: visibility, networking opportunities and potential for generating new resources. Jeanrenaud (2006) lists the corporate objectives supported by sport sponsorship: increasing firm and brand reputation on the market, consolidating organizational identity and image, improving public perception about the company, changing consumers' attitude and communicating with current or potential clients, enhancing employees' motivation and retention in the company, increasing sales and market share, managing stakeholders, supporting diversity, overcoming cultural barriers etc. In contrast, the costs (resource consumption) for companies that support sport enhancement are not dealt with in the mainstream literature.

A specific subject related to sport sponsorship by companies is the analysis of positive effects that this orientation could have on the employees (Hickman et al., 2005; Khan and Stanton, 2010). The resultant benefits generate higher satisfaction, productivity and efficiency of the employees, which lead to increasing the revenues and profits of the company, improving the satisfaction of the consumers and reducing the replacement rate of the employees (Khan and Stanton, 2010).

The corporate support for sport generates positive effects also for the community at large, through the strategic and sustainable CSR policies. Smith and

Westerbeek (2007) consider that business managers, likewise sport managers, may consolidate the economic benefits of their organizations and maximize the social benefits for the society by better using the sport potential to contribute to the achievement of community objectives. However, companies are still reserved when it comes about their sport contribution, meaning that the above presented advantages also involve significant consumption of resources.

Although there are examples regarding the potential of sport to contribute to enhancement of organizational performances, there is no integrated approach about the influence of corporate involvement in sport on the economic efficiency and, even less, there are no dedicated studies about the disadvantages (resource consumption) caused by the corporate support for sport and their inclusion in the analysis of economic indicators. The need for this research is justified because of the simultaneous examination of the corporate involvement in sport at internal and external levels, as well as the assessment of corporate efforts for supporting sport.

One of the main methods used to evaluate the economic efficiency in relation with sport – in general, for well-known sports associations and clubs – is DEA (Data Envelopment Analysis), and a comparison between sport organizations and business companies in the present research allows for the correct identification of the elements that will be included and assessed as inputs and outputs of our model. For evaluating the efficiency of the sport organizations, some examples of inputs-outputs are presented in literature: GDP per capita and population vs. number of won medals (Wu et al., 2009); cost of labour and capital vs. total sales, earned points and public participation (Pestana Barros et al., 2009); number of players and total costs vs. total revenues, earned points and number of spectators (Douvis and Pestana Barros, 2008); costs with employees and total expenses of the club vs. turnover (Guzmán, 2006) etc.

2.2. Evaluation of economic efficiency through DEA method

Every economic agent faces the problem of limited resources and, as such, the decision about finding the optimal combination of specific inputs-outputs for its activity. The selection of the optimal solution is based on given criteria (decision or choice variables) and it is carried out from the set of feasible solutions associated with the problem. The values for the choice variables – that the decision-maker has to determine in order to achieve the proposed objectives – are represented by the inputs vector (used in production) and the outputs vector (to be produced). The inputs-outputs vector must be viable and it is included in the feasible region associated with the problem. When the objective function of the decision problem has one finite optimal solution comprised within the feasible region associated with the problem, then the finite optimal value may be used for evaluating the efficiency of the respective economic agent.

Data Envelopment Analysis (DEA) is a nonparametric method for measuring the efficiency of a set of decision-making units, which use the same type of inputs, in order to produce the same type of outputs. Considering the methods for evaluating the efficiency of groups of companies, the DEA method – which was conceptually proposed by Farrell (1957) and lately developed by Charnes et al. (1978) – became a mathematical-based instrument. When dealing with large data sets, the DEA application should be followed by the informational synthesis, so that every decision-making unit (DMU) to be able to adopt the optimal decision for complying with the objectives set by the management of the company.

For the two DEA models (CCR – by Charnes et al., 1978, used for constant returns to scale and BCC – by Banker et al., 1984, used for variable returns to scale), the complex requirement of efficiency evaluation is reduced to solving different linear programming problems. The DEA method was well-scientifically settled and there are many studies in the literature that complement or modify the two initial models. The informational outburst in the last two decades and the need for a specific method for analysing the efficiency of human actions lead to an exponential growth of DEA applications. In addition, the increasing number of DEA practical applications is also due to the development of software programs for solving linear programming problems. In this way, using software packages like SAS, DEAP, IDEAS etc., the implementation of DEA method for evaluating the efficiency of very large data sets became a relatively easy practice.

Along with the theoretical and abstract development of DEA method, its first practical applications were proposed in the literature. For example, Andersen and Petersen (1993) suggested one technique for ordering the companies according to their efficiency scores, whereas Torgersen et al. (1996) offered one alternative for the corporate ranking based on the analysis of the slack variables arising from the application of DEA method.

Identifying the efficiency scores for each company refers to the split of the original data set into two categories – the efficient and, respectively, the inefficient units. However, such a corporate ranking is not enough, and the type of production function is an essential information for a DMU, as shown in the DEA method. DEA determines the convex hull generated by the inputs-outputs vectors associated with the decision-making units in the initial data set and it identifies the linear piecewise function on the efficient frontier corresponding to the data set. Using the decision-making units situated on the frontier resulted after applying DEA, the inefficient groups of DMUs can be identified, by measuring the distance between the frontier of the data set and the inputs-outputs vector associated with the inefficient DMU. Thus, the ranking of companies in groups associated with different regions on the efficient frontier is achieved, and the type of production function used by every DMU in its core activity is also identified.

The efficiency evaluation using DEA-CCR and BCC models may lead to the inclusion of slack variables in the optimal solution, which means an incorrect efficiency assessment for the analysed DMU. The removal of this drawback could be done by using non-radial measures for quantifying the efficiency in the DEA models (Cooper et al., 1999) or alternative approaches also based on non-radial distances, but applied to the slack variables: assurance region (Thompson et al., 1986) and cone ratio analysis (Charnes et al., 1990).

The models for measuring the efficiency assume the implicit hypothesis of dealing with non-negative values for the variables corresponding to the DMUs in the initial data set. Silva Portela et al. (2004) present in detail the process of dealing with negative data in DEA models. The existence of negative data in the original series could be eliminated by applying different conversions, so that these variables will take positive values, as suggested by Pastor (1994) and Lovell and Pastor (1995). The alteration of the initial data determines changes in interpreting the results of the DEA application (Seiford and Zhu, 2002). The most used model for measuring the efficiency of data sets containing negative values is the additive DEA model with variable returns to scale, proposed by Charnes et al. (1985), which is translation invariant, as proved by Ali and Seiford (1990) and stressed by Silva Portela et al. (2004). Nevertheless, the model used in case of negative data is influenced by the data size on the measurement scale, which means that it is not invariant in relation with the measurement units. Hence, Lovell and Pastor (1995) recommend a transformation to this model, by weighting the slack variables with the standard deviation of the initial variables, changing the model so that it becomes invariant with respect to the measurement units (Silva Portela et al., 2004).

The identification of efficiency scores by using DEA method for very large data sets may prove to be insufficient and, sometimes, it is also necessary to synthesize the information of the DMUs by grouping them into clearly defined groups – the cluster analysis. The groups identified after clustering should comprise similar units in terms of considered variables, but different from the units included in other clusters. A detailed presentation of the clustering principles was made by Ruxanda and Smeureanu (2012). Appealing to the rules specific to cluster analysis, Po et al. (2009) propose the use of efficiency scores in order to delineate the clustering of the DMUs, by identifying the type of production technologies used by every DMU. The clustering method proposed by Po et al. (2009) is basically similar with the partitioning-based techniques in cluster analysis, but the number of clusters for splitting the initial data set is determined by the number of efficient decision-making units. Amin et al. (2011) demonstrate that the application of the clusterization algorithm for the solutions of the DEA-CCR model leads to the identification of multiple solutions and allocation of DMUs into structurally different groups, having as a consequence an inconclusive interpretation of the results. As an alternative for this situation, Moazami Goudarzi and Jaber Ansari (2012) suggest that the number of clusters to be equal with the number of efficient DMUs with unique solutions in the DEA-BCC model.

3. DATA AND RESEARCH METHODOLOGY

The evaluation of organizational efficiency in relation with sport support was carried out for a sample of 50 companies that develop business activities in Romania, for the 2010-2012 period. The selection of firms and their corresponding inputs-outputs were based on two premises: i. the availability of necessary data on the official websites; and ii. the reference to the specialized literature in order to investigate on the proposed objectives.

3.1. Data used in the model

The 50 ***analysed companies*** were selected according to their financial performances (top 50 companies in Romania by their turnover at the end of 2012 – ranking for 2013, available on the site Doingbusiness.ro, 2014), by considering their financial results officially communicated to the Ministry of Public Finance. Banks, financial and insurance-reinsurance companies were not included in the respective sample. Using the top financially performing companies is a common practice in the scientific research, because of the good coverage that these leader companies have of the market. Regarding the sectorial distribution, the 50 companies fall into nine industries: oil and gas (9 companies); electric and energetic (7); retail of food and tobacco products (7); machinery, components, equipment and electronics (6); agriculture and food (6); semi-finished products (5); telecommunications (4); tobacco (4); pharmaceuticals (2).

In view of a strategic and functional correspondence with the researches about efficiency evaluation using DEA in sport organizations, we considered that the ***number of employees*** and ***corporate involvement in sport*** are an adequate expression for the *inputs*, whereas the ***profit*** optimally represents the *outputs*, when assessing the economic efficiency of top financially performing firms in Romania, that directly or indirectly support sport for their inside or outside stakeholders.

The number of employees reflects the size of the organization and, as such, the institutional effort for achieving corporate objectives, which complements the financial and material components of the necessary resources. In studies regarding DEA applications for evaluating organizational efficiency, the number of members or employees and the corporate effort for supporting or compensating them (Douvis and Pestana Barros, 2008; Guzmán, 2006) are usually inputs. The number of employees for the 50 companies in the current research was retrieved from the specialized site http://doingbusiness.ro, for the 2010-2012 period.

The corporate involvement in supporting sport is the distinctive input indicator and it was innovatively conceived and evaluated, because companies do not report in an aggregated form specific information regarding the number of supported sport events or the financial investments for enhancing sports. The indicator expresses the size of the support for sport of each company, and it is quantified by the number of relevant mentions regarding sport that are available on the official corporate website. The individual corporate computing of the indicator generates different values for companies belonging to the same Group, but that are distinct functional and legal entities. The number of relevant mentions regarding sport only quantifies the particular actions carried out for supporting sport through allocation of corporate resources and not the simple indication of ‘sport’ term.

The exclusive consideration of sport mentions on the official websites of the companies – in order to highly reflect the corporate image regarding sport support – was based on the decisive role that online media has for corporate communication and CSR policies. The indicator of corporate involvement in supporting sport is a cumulative value (not represented at yearly level) and the only one possible in this context (companies communicate only in rare and isolated cases the values that they assign for sport support). The indicator reflects the sum of total sport references for corporate employees (internal side) and total sport mentions for other categories of stakeholders (external side). Further details on assessing the indicator could be provided by the authors upon request.

The profit – as the sole measure for the outputs of the model for evaluating corporate efficiency – was selected because of its financial relevance. The profit is the most significant financial indicator when evaluating the corporate performance and the interest for studying its evolution became even more prominent in the post-crisis period. Profit, turnover and total revenues are the outputs more frequently analysed in studies dedicated to evaluation of organizational efficiency by applying DEA method (Douvis and Pestana Barros, 2008; Guzmán, 2006; Pestana Barros et al., 2009). The values for the net profits of the selected 50 companies, for the 2010-2012 period, were retried from the specialized site http://doingbusiness.ro.

The statistical data analysis could be provided by the authors upon request. Regarding *the net profit*, the minimum values are negative for all three years, the maximum values are positive and they register high differences from one year to another, the ranges have the same trend, the mean values are increasing, the asymmetry – positive, and the data series – leptokurtic (2011) and platykurtic (2010 and 2012). For *the number of employees*, the minimum values are increasing, the maximum values, ranges and mean values are decreasing, the asymmetry is positive and with relatively constant values from one year to another, while the data series is leptokurtic for the whole period. *The corporate involvement in sport* has constant ranges, minimum and maximum values, the mean values register low yearly fluctuations, the data series is positive asymmetric and leptokurtic.

3.2. Application of the research methods

The easiest way for stating performance is as ratio between inputs and outputs, but such performance appraisal is difficult to achieve when more inputs are used and more outputs are obtained. Thus, if every decision-making unit (DMU) is characterized by n inputs and m outputs, $x_i^j, i = \overline{1,n}$ are the values for the input variables for j DMU, $y_k^j, k = \overline{1,m}$ are the values for the output variables for j DMU, and $j = \overline{1,t}$ are the number of observations in the initial data set. The DEA-CCR model in its original form has two main limitations: the first one refers to the implicit non-negativity of the vectors associated with the inputs and outputs, and the second one deals with the translation invariance of the values of the initial variables included in the model. In the case of our model, the profit (output) is negative for more than a quarter of the investigated DMUs.

These drawbacks could be removed by using DEA models with variable returns to scale (VRS) through directional distance functions for efficiency assessment, that were initially proposed by Chambers et al. (1996) and refer to increasing the outputs while simultaneously decreasing the inputs. The definition of the production possibility set and its properties are presented in detail in Ray (2004).

Considering the inputs-outputs vector (x, y) and the reference vector with positive components (g^x, g^y), then, in the most general case, the directional distance function for the reference vector in relation to the T production possibility set associated with the analysed DMUs is represented in the following equation:

$$D(x, y, g^x, g^y) = \max\{\beta / (x + \beta g^x, y + \beta g^y) \in T\} \quad (1)$$

The reference vector (g^x, g^y) could be represented by any vector with positive components, but the authors recommend the use of $(-x, y)$ vector:

$$D(x, y) = \max\{\beta / (x - \beta x, y + \beta y) \in T\} \quad (2)$$

which means reducing the inputs and increasing the outputs with the same β factor.

Taking into account the way of presenting the production possibility set with variable returns to scale, the DEA-VRS model could be:

$$\max\{\beta \,/\, \sum_{j=1}^{t} \lambda_j y_k^j - \beta g_k^y \geq y_k^j,\ k = \overline{1,m};\ \sum_{j=1}^{t} \lambda_j x_i^j - \beta g_i^x \geq x_i^j,\ i = \overline{1,n};\ \sum_{j=1}^{t} \lambda_j = 1;\ \lambda_j \geq 0,\ j = \overline{1,t};\ g_k^y \geq 0,\ k = \overline{1,m};\ g_i^x \geq 0,\ i = \overline{1,n}\} \quad (3)$$

The existence of negative values for some inputs and outputs associated with DMUs leads to the impossibility of applying the model in equation (3), because the non-negativity restrictions imposed to the components of the reference vector are not fulfilled. Silva Portela et al. (2004) propose the transformation of the initial data so that all restrictions in equation (3) to be satisfied. The transformation could be applied when there are negative values of the variables only for some DMUs in the data set, and the values of the variables for the rest of the DMUs are positive. For the whole data set, the ideal DMU is the artificial unit with maximum values for the output variables and, respectively, minimum values for the input variables, being described by the relation:

$$(x^I, y^I) = \left(\min x^j, \max y^j\right),\ j = \overline{1,t} \quad (4)$$

By using the ideal DMU, the vector of the differences between every DMU o in the initial data set and the ideal company is computed as follows:

$$(R^x, R^y)_o = (x_i - x^I,\ y_i - y^I)_o,\ o = \overline{1,t} \quad (5)$$

This transformation implies getting positive values for the differences vector $(R^x, R^y)_{o=\overline{1,t}}$, which could be used as reference vector in model (3). The range directional model (RDM) of Silva Portela et al. (2004) is achieved:

$$\max\{\beta \,/\, \sum_{j=1}^{t} \lambda_j y_k^j - \beta R_k^y \geq y_k^j,\ k = \overline{1,m};\ \sum_{j=1}^{t} \lambda_j x_i^j - \beta R_i^x \geq x_i^j,\ i = \overline{1,n};\ \sum_{j=1}^{t} \lambda_j = 1;\ \lambda_j \geq 0,\ j = \overline{1,t}\} \quad (6)$$

In the inputs-outputs vector space associated with the data set, the potential company (related to an ideal DMU) represents the origin of the new axis system used for representing the units in the initial set. When dealing with the differences vector, some components will be zero for the units with maximum outputs, respectively for the units with minimum inputs. This situation is found for the DMUs that cannot improve the values for the variables included in the ideal vector, because the restrictions associated with the null components of the differences vector are binding when the optimal solution of the RDM model is determined.

For the optimal solution, at least one restriction will be binding, meaning that the optimal value of β will be $(\breve{y}_k - y_k^o)/\left(R_k^I\right)_o$, if the binding restriction refers to *k* output, respectively $(x_i^o - \breve{x}_i)/\left(R_i^I\right)_o$, if the binding restriction refers to *i* input. No matter the type of the binding restriction, the value of β is calculated as a ratio between the slack variable associated with the binding restriction and the corresponding value in the differences vector, so that the decision variable β is the inefficiency measure for the DMU for which it was determined. In this way, $1 - \beta$ is the efficiency measure in the RDM model of Silva Portela et al. (2004).

Using relations (4) and (5), the efficiency could be expressed as follows:

$$\frac{\breve{x}_i - \left\{\min\limits_{j=1,\dots,t} x_i^j\right\}}{\left(R_i^I\right)_o}, \text{ if the binding restriction is associated with input i;} \quad (7)$$

$$\frac{\left\{\max\limits_{j=1,\dots,t} y_k^j\right\} - y_k}{\left(R_k^I\right)_o}, \text{ if the binding restriction is associated with output k.} \quad (8)$$

The solution offered by the RDM model and used for evaluating the efficiency of a DMU is always subunitary, the numerator being lower than the denominator in the relations (7) and (8):

$$\breve{x}_i - \left\{\min_{j=1,\dots,t} x_i^j\right\} \le x_i^j - \left\{\min_{j=1,\dots,t} x_i^j\right\} \text{ and } \left\{\max_{j=1,\dots,t} y_k^j\right\} - y_k \le \left\{\max_{j=1,\dots,t} y_k^j\right\} - y_k^j.$$

A DMU will be Pareto efficient if the value of β is zero, and all the restrictions of the model (6) are binding, meaning that the slack variables are all equal to zero. In the RDM model, the two main properties of the DEA models are fulfilled, and their detailed analysis is presented in Silva Portela et al. (2004).

Using the efficient DMUs obtained after applying the RDM model, the procedure for finding the hyperplanes to delimit the efficient frontier of the DMUs is used. This algorithm is described by Moazami Goudarzi and Jaber Ansari (2012), being adapted for the RDM model previously presented. The hyperplanes that define the efficient frontier pass through the extreme efficient DMUs – the ones for which the optimal solution of the linear programming problem (9) is zero. Moazami Goudarzi and Jaber Ansari (2012) present in detail different issues regarding the problem of linear programming (9):

$$\max\left\{\sum_{i=1, i\neq j}^{n} \lambda_i \;/\; \sum_{i=1}^{t} \lambda_i y_k^i - \beta R_k^y \ge y_k^j,\ k = \overline{1,m};\ \sum_{i=1}^{t} \lambda_i x_i^i - \beta R_i^x \ge x_i^j,\ i = \overline{1,n};\ \sum_{i=1}^{t} \lambda_i = 1;\ \lambda_j \ge 0,\ j = \overline{1,t}\right\} \quad (9)$$

The clustering algorithm is based on the partitioning-based methods in the general cluster analysis, except that, in this specific case, the number of clusters for grouping the initial data set is determined by the number of identified marginal hyperplanes. Every extreme efficient DMU will be allocated in only one cluster. The intercept in the equation that describes a marginal hyperplane is considered to be the proximity measure between the respective marginal hyperplane passing through a particular extreme efficient DMU and each DMU. In view of the above description, the clustering algorithm for determining the informational structure of the initial data set is due to Moazami Goudarzi and Jaber Ansari (2012).

4. ACHIEVED RESULTS AND ANALYSIS

The research was conducted for evaluating corporate efficiency in relation with resource consumption dedicated to sport support, by applying the DEA method and the cluster analysis for an initial sample of 50 best financially performing companies in Romania for the 2010-2012 period. The calculation of the efficiency scores for the three years and the subsequent division into clusters of the selected companies (DMUs) was made by removing those DMUs with outliers for their input or output variables in the original data set, respectively extreme values highly distant from the other values of the sample, whose inclusion would have decisively influenced the reference value of the indicators and the objectivity of the achieved results and clusters. Thus, for each year, the totals of DMUs considered were: in 2010 – 41 DMUs, in 2011 – 43 DMUs, and in 2012 – 40 DMUs.

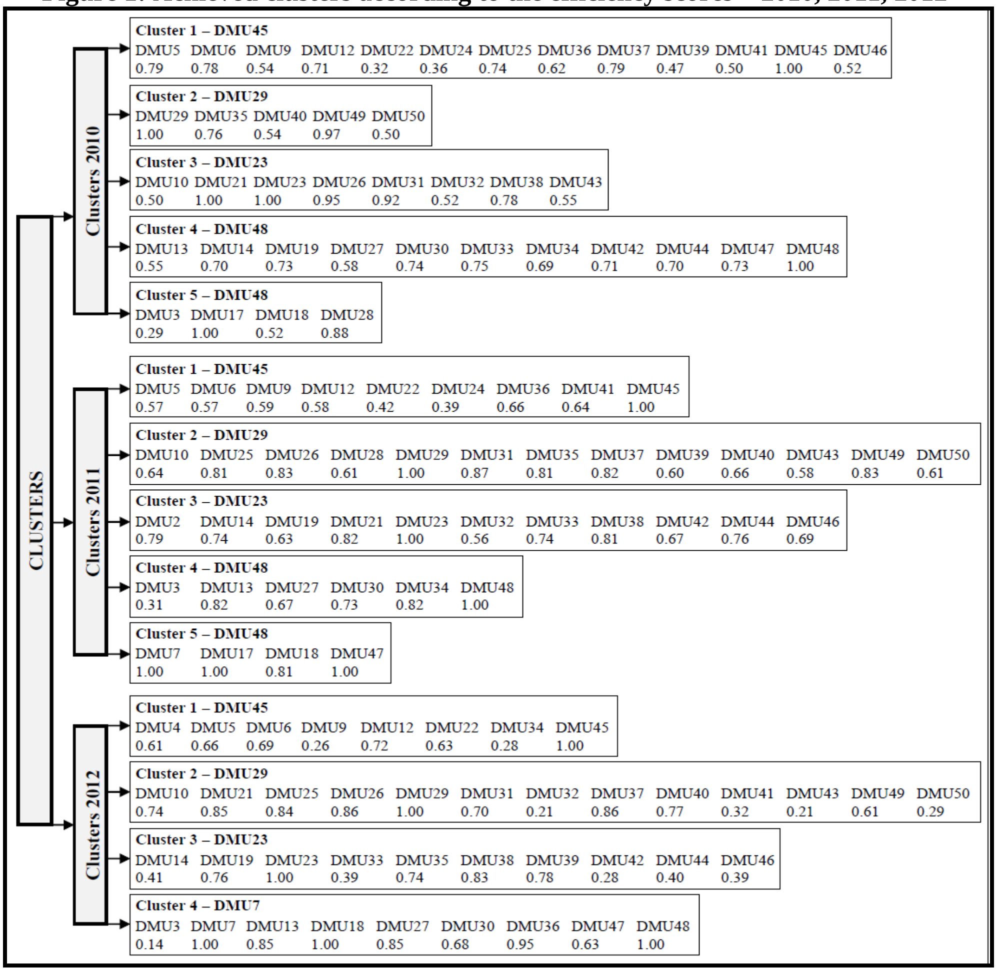
After applying DEA-VRS method for evaluating corporate efficiency in relation with sport-dedicated resource consumption, the efficiency scores were obtained for the analysed companies. The achieved results emphasize the number of maximum efficient DMUs for the specified period: 6 companies in 2010, 7 in 2011 and, respectively, 6 in 2012, 4 of which are common and maximum efficient for all the three years. 3 out of the 4 maximum efficient companies for the whole period belong to agriculture and food industry and they have zero involvement in sport, but also a relatively low number of employees compared to other firms in the sample. Considering a significant threshold of organizational efficiency of at least 50%, it is observed that most of the investigated companies were relatively good-efficient with respect to their sport investments: 37 companies (90.2%) out of the 41 analysed for 2010, 40 (93.02%) out of 43 in 2011, but only 28 (70%) out of 40 in 2012, and the same trend is also respected for the average efficiency scores obtained for the three years: 0.7 (2010), 0.73 (2011) and 0.65 (2012). The detailed presentation of the results, i.e. the efficiency scores for all analysed companies during the three years period, could be provided by the authors upon request.

The breakdown of the analysis at industrial level is rather constant for the three years, showing that business sectors like agriculture and food, oil and gas, electric and energetic are more efficient, while firms in machinery, components, equipment and electronics and telecommunication industries are less efficient. The organizational efficiency is essentially determined by the corporate variables and macroeconomic context, and it is less influenced by the industrial background, as proved by different classifications of some companies in the three annual rankings.

The corporate involvement in sport – in terms of investment of resources – pays off when it is correlated with good outcomes for the profit (maximization of the results) and for the employees (minimization of the expenses) at organizational level. On the other hand, the companies with solid profit and high number of employees are efficient when the corporate support for sport complements their CSR policies in relation with different stakeholders. Conversely, the corporate inefficiency is caused by a less rational use of resources or a lack of strategic correlation between economic and social objectives. Therefore, the identification of an optimal point between resource consumption and achieved results represents a challenge for the business managers, including when analysing the corporate efficiency in relation with sport involvement.

After applying DEA clustering for grouping the achieved efficiency scores, five clusters resulted for 2010 and, respectively, for 2011, and only four clusters for 2012. The obtained clusters and the dominant variables they related to, as well as the investigated DMUs and their corresponding efficiency scores are emphasized in *Figure 1*. The classification of the DMUs was made according to a common pattern identified in relation with their proximity to one of the DMUs situated on the efficiency curve. Although the fourth and the fifth clusters (for 2010 and 2011) related to the same DMU48, the significant structural differences regarding the number of employees and net profit do not allow their linking into one single group.

Figure 1: Achieved clusters according to the efficiency scores – 2010, 2011, 2012



Source: Authors' representation.

For all three years, the average net profit was the main element for delimiting the clusters, and the profit has an ascending trend when advancing from one cluster to another, with the sharpest differences registered for 2011 (*Table 1*).

Regarding the average efficiency of the clusters, this indicator remained relatively constant and it did not register variations higher than 15% for 2010, but it marked a more pronounced difference in 2012 (0.5974 – for third cluster, 0.7889 – for fourth cluster) and, especially, in 2011, when the efficiency score of the fifth cluster was very closed to the unitary value (0.9535), but it was situated at high distance from the scores of the first four clusters, which ranged between 0.6 and 0.75. The analysis of the corporate involvement in sport emphasizes the high performance of the fifth cluster compared with the rest for 2010, respectively the good support for sport of the fourth and fifth clusters – for 2011, and the fourth one – for 2012. Thus, the evidence shows that, in general, mainly the companies with increased profitability have the corporate availability to significantly invest in the sport area, bearing the assumed risk of decreasing their organizational efficiency on the short run, but being aware of the strategic role that social investments may have on strengthening corporate sustainability and performances on medium-long term. The sport investment is still hazardous, because there are no studies to confirm an increase of organizational performances as a result of corporate support for sport.

The sharp increase of the average number of employees causes a decrease in efficiency (see the fourth and fifth clusters for 2010, the fourth group for 2011 and the third one for 2012). The fifth cluster in 2011 (and, to a lesser extent, the fourth in 2012) stand out as examples of good practice, their included companies being able to efficiently use the available resources and optimize their consumption in order to achieve a higher corporate efficiency. The conclusion at this point is that a profit increase, not accompanied by a rational use of all types of resources, is not enough for assuring an improvement in the corporate efficiency.

Table 1: Achieved clusters after applying DEA method – 2010, 2011, 2012

Cluster	Variable	Range	Min.	Max.	Mean	Std. Dev.
			2010			
1 (13 obs.)	ScorEffic	0.6813	0.3187	1	0.6260	0.1969
	NetProfit*	273047067	-303083226	-30036159	-121541724	85772348
	Employees**	7394	136	7530	2167	2364
	Sport***	22	0	22	6.31	6.88
2 (5 obs.)	ScorEffic	0.4961	0.5039	1	0.7554	0.2309
	NetProfit*	27670297	-19334976	8335321	-204850	10967343
	Employees**	3100	84	3184	1350	1593
	Sport***	17	0	17	5.40	6.99
3 (8 obs.)	ScorEffic	0.4980	0.5020	1	0.7771	0.2217
	NetProfit*	73958747	14516268	88475015	43549688	22760474
	Employees**	2710	150	2860	1108	998
	Sport***	14	0	14	5.25	5.92
4 (11 obs.)	ScorEffic	0.4502	0.5498	1	0.7160	0.1140
	NetProfit*	187201877	100484828	287686705	171833691	47289189
	Employees**	6280	843	7123	2892	1756
	Sport***	28	0	28	6.91	9.40

5 (4 obs.)	ScorEffic	0.7072	0.2928	1	0.6719	0.3262
	NetProfit*	358840154	292368000	651208154	432642070	171259919
	Employees**	10859	2964	13823	6957	4740
	Sport**	55	3	58	24.75	24.31
2011						
1 (9 obs.)	ScorEffic	0.6140	0.3860	1	0.6028	0.1754
	NetProfit*	453890298	-471350988	-17460690	-165585820	161322840
	Employees**	5633	138	5771	2014	1923
	Sport***	22	0	22	7.44	7.70
2 (13 obs.)	ScorEffic	0.4220	0.5780	1	0.7431	0.1339
	NetProfit*	44500773	-12647951	31852822	9292999	15331487
	Employees**	6820	90	6910	2015	2281
	Sport***	17	0	17	5.38	5.41
3 (11 obs.)	ScorEffic	0.4386	0.5614	1	0.7469	0.1145
	NetProfit*	117865101	44927593	162792694	104465344	43267533
	Employees**	6694	257	6951	2364	1997
	Sport***	37	0	37	6.91	11.52
4 (6 obs.)	ScorEffic	0.6881	0.3120	1	0.7237	0.2308
	NetProfit*	110627621	202239107	312866728	238958902	45174716
	Employees**	12912	740	13652	4065	4894
	Sport***	58	0	58	18.67	21.91
5 (4 obs.)	ScorEffic	0.1860	0.8140	1	0.9535	0.0930
	NetProfit*	714694344	317054628	1031748972	534871195	334208768
	Employees**	5480	299	5779	2929	2243
	Sport***	27	0	27	10	12.30
2012						
1 (8 obs.)	ScorEffic	0.7420	0.2580	1	0.6054	0.2416
	NetProfit*	279332538	-297653500	-18320962	-153113666	106603455
	Employees**	5230	106	5336	1917	1781
	Sport***	22	0	22	5.88	7.42
2 (13 obs.)	ScorEffic	0.7926	0.2074	1	0.6361	0.2805
	NetProfit*	69755195	-6586180	63169015	28128863	22044041
	Employees**	5562	131	5693	1637	1740
	Sport***	17	0	17	5.85	6.07
3 (10 obs.)	ScorEffic	0.7248	0.2752	1	0.5974	0.2503
	NetProfit*	134682610	67569722	202252332	108976873	42810789
	Employees**	8615	230	8845	3176	2882
	Sport***	16	0	16	3.40	4.90
4 (9 obs.)	ScorEffic	0.8568	0.1432	1	0.7889	0.2784
	NetProfit*	292601873	209555220	502157093	328496920	92408822
	Employees**	13340	300	13640	3201	4263
	Sport***	58	0	58	14.33	18.70

Note: * - net profit in RON; ** - number of employees; *** - sport involvement.
Source: Authors' representation after data processing.

The comparison between the average values of each cluster and the ones of the dominant DMU – that represents the respective cluster – allows for a series of observations regarding the appropriate directions to be followed by the poorly performing companies in order to improve their efficiency. In 2010, all companies in the first cluster have consistent losses, and their net profits and total employees are the main deficient issues in contrast with the dominant DMU. The five DMUs with the closest profits to zero are included in the second group (2010), while their number of employees is strongly oscillating from one company to another. In the third cluster (2010), the average efficiency does not exceed the 0.78 threshold, although it is the highest annual efficiency score, and the number of employees is the main variable that could be improved when relating to the dominant DMU. For the fourth group (2010), the efficiency decreases (0.716) when compared with the previous case, even though the average net profit increases, hence the business organizations from this cluster had an irrational consumption of resources or they considered sport support as a long term investment. This situation is similar with the one encountered for the last cluster (2010), but to a higher level for the latter.

In 2011, the first and the least efficient formed cluster stands out by severe unbalances registered for all three variables (net profit, number of employees and sport involvement) in comparison with the dominant DMU, and this situation is reflected in the negative financial performances for all nine included companies. For the second group (2011), the very low average productivity of the employees and the reduced consideration of sport in contrast with the dominant DMU are the weak points to be outlined, while for the third cluster (2011) the notable differences are situated in the inputs area (employees and sport). In what concerns the fourth cluster (2011), the recommendation focusses on more rational use of resources for improving the broad organizational efficiency, which is the second worst efficiency after the first group. The fifth cluster (2011), with an average efficiency very close to the maximum one, is remarkable including by considering sport as a strategic resource for its competitiveness, highly correlated with its financial strength.

For 2012, the first cluster is highly deficient in terms of profitability, the eight companies included in this group registering a net loss at the end of the financial year. The recommendation for the business organizations in the second group (2012) refers to a higher focus on corporate support to sport, by comparing it with the value of the dominant DMU for this variable. The companies in the third cluster (2012) need a reconsideration of their use of available resources, in order to increase the overall efficiency. The companies in the last group (2012) have the average net profit fairly similar with the one of the dominant DMU, and this is the case when the average and the optimal values are the closest of all three years.

Although similar to some extent, the achieved results are not identical from one year to another. The organizational efficiency and competitiveness – including in relation with corporate sport support – are decisively influenced by the macro-economic context of the post-crisis period and the industry the companies belong to.

5. CONCLUSIONS AND FURTHER RESEARCH

The present study examines the corporate efficiency from an innovative perspective and it is based on the goal of increasing organizational performances and achieving competitive differentiation through rational use of resources and high-return investments. Assuming the implicit premise of the benefits that sport support in all its forms may induce at corporate level, the research investigated the impact that sport-related consumption of resources has on organizational efficiency. Although the corporate involvement in sport generates specific advantages for the accountable companies on medium-long term, it is resource consuming on the short run. The investment in sport pays off for companies only when it is strategically correlated with the corporate financial objectives and resources. Similar with CSR actions, the corporate support for sport should remain a competitive advantage and it should not turn into an unsustainable expense for the business organizations.

The companies that allocate resources for sport support are ussualy the strongest firms in financial terms and they afford this investment by assuming further benefits. The most efficient companies are the ones that succeeded to identify an equilibrium between resource consumption (with employees and sport) and achieved results (net profits), then the analysis of the efficiency scores should be considered on longer term and not be isolated from the real context.

The key recommendation focusses on the right assessment that companies must take on regarding the consumption of resources in the post-crisis period and the strategic correlation of all invested resources with current financial reserves. This research is a starting point for evaluating organizational efficiency in relation with the consumption of sport-dedicated resources, because fims could follow the examples of the best performing companies in the field.

Considering the growing role of the social factors in consolidating the distinctive competences of companies on the market, the present research could be developed further on. The future directions for investigation refer both to continue the assessment of corporate efficiency for the analysed companies in the next period and to extend the selected sample for also including other types of firms in Romania or abroad. Moreover, the influence assessment of the corporate support for sport on organizational efficiency and performance on medium and long terms using alternative econometric methods is of interest for the business environment.

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