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Measuring the efficiency of Russian Football Premier League clubs

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Authors propose a methodology for quantitative analyses of football clubs' efficiency, including following steps: (1) theoretical analyses of production process in football; (2) its empirical evidence based on structural equation modelling (PLS-SEM); (3) calculating the efficiency in football using Data Envelopment Analysis (DEA). The article considers 4 seasons of Russian Football Premier League (2012/2013 2015/2016). Applied approach can help football clubs to identify respective weaknesses and focus on efficiency-enhancing strategies.

keywords: efficiency of football club, production process of football club, DEA, PLS-SEM.

1 Introduction

In Russia football is considered to be the most social and economically important sport. The increasing commercialization of sports calls for a professionalization of football clubs. Due to the increasing commercialization of sports development and its competitiveness, the demand for efficient use of resources within a football club is becoming more and more relevant (Kern et al., 2013).

Several studies dealt with the measurement of efficiency of football clubs (Haas, 2003; Barros and Leach, 2006; Bosca et al., 2009; Kern et al., 2013). The authors of these papers applied a model-based approach and used a common method to measure efficiency, data envelopment analysis (DEA). This is a linear programming-based methodology and a non-parametric approach for evaluating the efficiency of a decision making unit

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(DMU), in our case a football club. DEA gives an opportunity to build up the production possibility frontier for several DMUs, which operate under the same conditions and transfer multiple inputs into multiple outputs. The efficiency of separate DMU is determined as distance to calculated production possibility frontier.

The main problem of DEA is to define the variables that allow to quantify the resources and results or define the inputs and outputs of the production function. In case of football club, many authors use a theoretical analysis of the production function, and obtained results depended on the particular context: the type of the tournament, sports or economic results, the period of time (one game or season), etc. Some authors (Garcia-Sanchez, 2007; Espitia-Escuer and Garcia-Cebrian, 2010; Kern et al., 2013; Petrovic Djordjevic et al., 2015) consider the multi-stage production process (the outputs of the previous stage are the inputs to the next one), and evaluate the effectiveness of football club consistently in all transformations.

In our research, we rely on a basic understanding of the production process of the football club, which we have adjusted due to the specifics of Russian football. For empirical validation of these findings, we use structural regression method of PLS-SEM (Partial Least Square - Structural Equation Modeling). Empirical analysis based on the data of the 4 seasons (2012/2013 to 2015/2016) of the Russian Football Premier League (RFPL) confirmed the production model, and proved the existence of links between its components. Based on this model, which includes 4 serial conversion of resources to results, we calculated the efficiency of all transformations for RFPL clubs in the season 2015/2016. Obtained results allowed to explain high or low results of various clubs.

2 Literature review

At least three different approaches to efficiency measurement in sports can be found in literature (Haas, 2003). These approaches include efficiency measurement on the level of single games, measurement of managerial or coaching efficiency and the analysis of a team's efficiency over an entire season. The aim of our study corresponds to the third approach - to determine the effectiveness of the team throughout the season. The effectiveness itself can be treated as achievement of sports or economic results. This fact also affects the choice of inputs and outputs.

Bosca et al. (2009) considered only the effectiveness of sport results and conducted a comparative analysis of the national leagues of Italy and Spain for three seasons (2000/2001, 2001/2002, 2002/2003). Based on the fact, that the winning team must score more goals than the opponent, they used as outputs 2 variables: offensive output (number of goals scored over the course of the season) and defensive output (inverse of the number of goals conceded by a team). As inputs were employed technical and tactical characteristics (shots-on-goal and etc., see Table 1 for details).

Espitia-Escuer and Garcia-Cebrian (2010), Petrovic Djordjevic et al. (2015), Espitia-Escuer and Garcia-Cebrian (2016) also considered only sport effectiveness. All these authors used technical and tactical characteristics as inputs and sport results as outputs (number of goals, points, playoff games). Roboredo et al. (2015) explores the conversion efficiency of three inputs (the number of home matches, the average attendance and the average points obtained at the last four seasons) into total points obtained at the season 2014 for Brazilian football clubs.

Most of researchers, however, consider sport achievements together with financial results. Haas (2003) uses following inputs: total wages and salaries (excl. coach); coach salary; home town population; and outputs: number of points, spectators and revenue. This model received a huge support from other researchers, who proposed to widen the number of inputs and use net assets and stadium facilities expenditure (Barros and Leach, 2006), market value (Kern et al., 2013), country strength coefficient (Pyatunin et al., 2016).

Many authors have noted that applying financial resources and the players wages as a proxy for input factors and sport results and revenue as a proxy for output makes the operating process of football club too crude and doesn't take into account all cycles and transformations (Baroncelli and Lago, 2006). Therefore, some researchers consider a multi-step operating process (the outputs of the previous stage are the inputs for the next one), and evaluate the effectiveness of football club consistently in all transformations. Garcia-Sanchez (2007) uses a three-stage scheme of analysis: actions in attack and defense affect the number of goals scored and goals conceded, which in turn determines the number of points and the final placing. Sports results determine the attendance of home games and, as a result, the financials. Espitia-Escuer and Garcia-Cebrian (2010) proposed a two-phase model: the skills and physical characteristics of players together with efforts of managers are converted to on-field performance. As a result, strategies and tactics define the product of this stage, that is, the cumulative result: points, spectators and revenue. Kern et al. (2013) also suggest a two-stage approach. The first stage represents the off-field operations of a football club: player salaries and financial resources are invested in order to create a competitive team. The second stage represents the on-field operations, meaning that the coaching staff is challenged to transfer the team's potential into sporting results and an increase in revenue.

An overview of the above mentioned models and models from some other sources is presented in Table 1. As we see, there is no consensus regarding the outputs and inputs of the production process of the football club. It is also clear that this process involves several steps of transformation of resources into results, and the outputs of previous stage are becoming inputs for the next one. Serial analysis of the effectiveness of the football club at each stage will allow us to look inside the operating process and provide recommendations on possible ways to improve it. Furthermore, it is desirable to confirm the presence of stages allocated in the theoretical analysis, with empirical data. All these issues will be discussed in the following sections in relation to Russian football.

3 Production process of Russian football club

3.1 The Russian Football Premier-League (RPFL)

Russian Football Premier-League (RFPL) is the top division of Russian football. 16 teams are participating in the tournament. Until 2010 the Championship ran from

March to November. Starting from 2012 football season is synchronized with Europe: from late July till May. Teams play each other twice, once at home and once away, obtain three points for a victory and one point for a draw. At the end of the season teams that finish at 15th and 16th positions are relegated directly. 13th and 14th clubs compete with 4th and 3rd clubs of First division in play-off matches.

3.2 Production process of football club

The production model of football club was offered by Baroncelli and Lago (2006), based on the analysis of the Italian Football, and identifies two alternative models: leading clubs and small clubs. Leading club is aimed at the transformation of sports results in revenue. This is achieved by creating a competitive team with a given amount of money and transforming the squad' potential into success. The revenue consists of match day income, TV-rights, commercial deals, prize money. Financial results are dependent from on-pitch performance that is why leading clubs aimed to achieve high results. Part of the revenue is reinvested in the acquisition of players. This sequence of transformations forms a vicious cycle.

Small club revenues are generated primarily through the sale of “homegrown” players. The production cycle begins with scouting talented young players for relatively cheap price. On the second stage a coach develops the talent of these players and transfer the team's potential into sporting results, which ensure the position of the club in the prestigious division. Finally such results provide the club with higher revenues (mainly from sponsors, television, gate receipts and through the sale of the players). These financial resources are used to restart the cycle with the acquisition of new players.

However, none of these models could be fully applied to the analysis of the production cycle of Russian clubs. The main restriction is concerned with the funding structure: most of Russian clubs are being financed by the regional budgets or companies affiliated with the state. Only 3 clubs can be recognized as private: Spartak Moscow, PFK CSKA Moscow, Krasnodar. There are no public entities among local FC and they don't disclose any financial metrics. The budgets and revenues could be found only in the reports of independent experts. Still it is clear that only large clubs are profitable. This could be explained by the low level of interest in football matches (attendances and TV ratings). As a result only few companies consider sponsoring or investing in football perspective. Still the majority of Russian football clubs are not aimed for financial income, and the results are connected with the prestige or social responsibility of the regional government, private investor or the state monopoly. Sport results are achieved mainly through the purchase of players. Only few clubs sell players at a higher price (compared to the value of their purchase).

Thus, the production process of Russian football club is close to the leading club (Baroncelli and Lago (2006)), but instead of making a profit the shareholders expect to obtain political (or social) results. This fact has an important consequence - the production cycle is not closed: current sport and financial results have no effect on its further funding, and clubs do not set a goal of becoming efficient.

Summarizing the discussion above, the production process of Russian football club comprises the following steps:

- converse the financial resources to the acquisition of skilled players;
- create a competitive team with a given amount of money;
- transform the squad's potential into sport results;
- transform sport results into political and/or social results.

Theoretical analysis of the production process of the Russian football club must be confirmed by empirical evidence. To prove existence of four stages of production process identified above we propose to use the PLS-SEM technique. After that, we will assess the effectiveness of the transformation at each stage with the help of DEA. Short description of both methods are presented in next Section.

4 Methods

4.1 Structural Equation Modeling

The measurement of parameters in social and economic systems is achieved by using observable variables - indicators. One of the most widely used techniques for that is Structural Equation Modeling (SEM). It is assumed that the matrix of the observable values $\mathbf{X}$ can be divided into J independent blocks X_j, and each of these blocks is associated with latent variable LV_j, $j = 1, ..., J$, and each block contains K variables. Latent variables are also referred to as factors or constructs. The basic idea is that the observed variables are mesurements of latent variables (reflective model), i.e. they are linked by the equation

$$X_{jk} = \lambda_{0jk} + \lambda_{jk} LV_j + \varepsilon_{jk}, \quad k = 1, ..., K, \tag{1}$$

or they form latent variables (formative model) and the corresponding equation looks like:

$$LV_j = \lambda_{0j} + \sum_k \lambda_{jk} X_{jk} + \varepsilon_j \tag{2}$$

Here λ_{jk} are factor loadings; ε_{jk},ε_j are errors of measurement

There are several types of problems that can be solved with help the SEM (Raykov and Marcoulides (2006)). The most relevant problem for our research is to build a structural regression, which allows to test the hypothesis of existence of relationships between the latent variables. These relationships can be presented in the following form:

$$LV_j = \beta_0 + \sum_{i \to j} \beta_{ji} LV_i + \varepsilon_j, \tag{3}$$

here ε_j is an error, β_{ji} are path coefficients, $i \to j$ means summation over all values i except $i = j$.

Obviously, the power of connection between the latent variables can be estimated by the value of β_{ji}. The parameters obtained by solving the equations (1) - (3) on the basis of empirical observations of $\mathbf{X}$ allow us to confirm or refuse the hypothesis.

One of the most popular techniques of solving the system of equations (1) - (3) is Partial Least Square (PLS-SEM), which does not require a normal distribution of the data, does not impose restrictions on the minimum sample size and has a number of other advantages. Therefore, PLS-SEM has recently gained increasing attention in various disciplines including marketing, strategic management, accounting, operations management, organizational research, etc. However, a relatively small number of researchers apply various modifications of SEM for the structural simulation in sport. Sanchez (2013) gives a fairly simple model describing the impact of offensive and defensive characteristics of the football team on the probability of winning the match. Arai et al. (2012) proposed and tested the conceptual model of athlete brand image, Biscaia et al. (2016) investigate the role of fan club membership on perceptions of team brand. Baghal (2012) employs SEM for prediction of sport results in NBA.

Based on the discussion of the production process in Russian football club we can identify 5 latent variables (financial resources, skilled players, competitive team, sport performance, political/social outcomes) that define its activities, and 4 hypotheses regarding the connections between them:

- H1: the amount of available financial resources has a positive effect on the skills of players (i.e. resources determine the possibility to purchase talented players);
- H2: players' skills have a positive effect on the competitiveness of the football team;
- H3: competitive balance of the team has a positive effect on sport performance;
- H4: achieved sports results have a positive effect on the political/social outcome.

Discussion of measurable indicators of latent variables and simulation results will be presented in the next section.

4.2 Data Enveloped Analysis

In microeconomics, production function determines the outcome (outputs), which can be obtained by different combinations of resources (inputs). If this function is known, we can determine whether a particular DMU gets the maximum number of outputs y using inputs x, i.e. evaluate the effectiveness of this DMU. In practice, the form of the production function is usually unknown and we have only empirical observations of input and output values for the set of the DMU. Therefore, to assess the effectiveness we need to construct production possibility frontier based on observable data.

There are two different methods used for solving this problem: first, the econometric or parametric approach, and second, the nonparametric or DEA approach. The main characteristic of the first (and, possibly, its main drawback) connected with the assumption regarding the existence of the production function in explicit form (Seiford and

Thrall, 1990). A nonparametric approach does not require the explicit form of this function, the DMU performance is evaluated in relation to other similar DMUs, operating under the same conditions. It is assumed that they are either on the boundary of production possibility frontier, or "below" it. In this case two problems should be solved: (1) the identification of standard (boundary of performance) on the basis of data from several DMUs and (2) evaluation of the effectiveness of a particular DMU based on this standard.

The general-purpose DEA developed by Charnes et al. (1978) considers n DMUs using k inputs to produce m outputs. Let us denote x_{il}, y_{jl} the observed level of the i-th input and j-th output ($i = 1, ..., k$; $j = 1, ..., m$), respectively, at DMU_l. An efficient score for the DMU_0 can be obtained as:

$$\max_{u,v} \frac{\sum_j u_j y_{j0}}{\sum_i v_i x_{i0}} \textit{ subject to } \frac{\sum_j u_j y_{jl}}{\sum_i v_i x_{il}} - 1 \leq 0 \tag{4}$$

where u and v are the output weights and input weights, respectively. This approach is referred as the CCR model. This model can be reformulated as a linear programming problem and can be written as:

$$\min_{z} \lambda \tag{5}$$

subject to

$$\sum_{l=1}^{n} x_{il} z_l - \lambda x_{i0} \leq 0, \ \sum_{l=1}^{n} y_{jl} z_l - y_{j0} \geq 0, \ z_l \geq 0 \tag{6}$$

here λ is a scalar variable measuring the level of efficiency.

5 Empirical Data and Results

5.1 Data Set

Our study is based on 4 seasons of RFPL from 2012/2013 to 2015/2016, when the championship was conducted according to the same scheme (see Section 3.1 for details). The results of the other seasons were not considered, since the season formula produces significant bias. So dataset includes 64 observations (16 teams took part in each season), and we can consider it as the complete sample. Sports results (for example, goals scored or the number of wins) are objective. Financial parameters (such as the team budget or its market value) were estimated in US dollars to avoid the impact of inflation between seasons. Table 2 contains the list of indicators and latent variables associated with them that are used in the PLS-SEM modeling, it also lists the links to data sources. To check homogenity of data over seasons one-way MANOVA was conducted. It confirms that there is not a statistically significant difference in data based on a season, $F(3, 153) = 1.595$, $p = .03$, Pillai's trace $V = 0.757$. Table 3 lists the statistics for gathered data.

5.2 PLS-SEM results

According to framework for accessing reflective and formative models (Coltman et al., 2008), we use reflective approach. For all latent constructs the following assertions are true: latent construct exists independent of the measures; variation in the construct causes variation in the measures; adding or dropping the measure does not change the conceptual domain of the construct; measures of one latent variable have high positive intercorrelations. If we remove the measure, the correlation of the remaining measures with the latent variable and the correlation between the remaining measures do not change (Simonetto, 2012).

We have used SmartPLS 3 software (Ringle et al., 2015). The final model is shown in Fig. 1. The latent variables are presented by ellipses, their indicators are presented by rectangles. The names of variables are shown inside the respective figures. For the latent variables we also provide values of Chronbach's α and R^2, path coefficients β_{ji} are shown near the arrows connecting the latent variables. The values of factor loadings λ_{jk} are shown near the arrows connecting the latent variables and indicators.

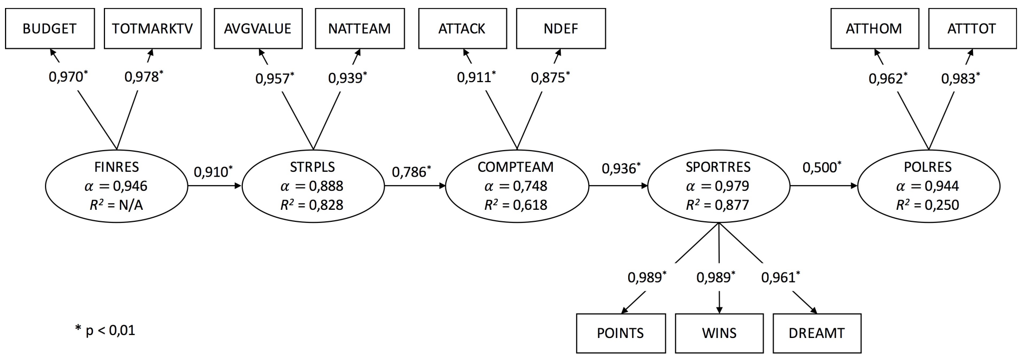

Figure 1: Structural model of production process of football club

The adequacy of the production process model was evaluated on the criteria of reliability, convergent validity, and discriminant validity. Reliability is examined using the composite reliability (CR) values. As shown in Table 4, all of these values were greater than the commonly acceptance level of 0.70 (Hair et al., 2006), indicating the existence of internal consistence. Table 4 lists the correlations among constructs, with the square root of the average variance extracted (AVE). Diagonal elements (in italics) are the square root of the AVE; off-diagonal elements are the correlations between constructs. All diagonal values exceed the inter-construct correlation, implying adequate discriminant validity. Finally, convergent validity was evaluated via AVE. AVE of each construct should exceed 0.5 (Fornell and Larcker, 1981). In addition, all indicators loadings higher on their own construct than on other constructs (i.e. cross-loadings).

Thus, PLS-SEM modeling completely confirms the hypothesises about the links between latent variables, formulated in Section 4.1. It means that definition of production process of the Russian football club is confirmed by empirical data. So, we can use production process model for evaluation of efficiency.

5.3 DEA results

Effectiveness of Russian football clubs at various stages of production in season 2015/2016, calculated on the basis of DEA, is presented in Table 5. The maximum possible efficiency value is 1.0, this means that the respective DMU is on the efficiency frontier. The lower value means the lower the efficiency of the team. We used input-oriented model, i.e. the value of efficiency defines possible reduction of inputs of corresponding DMU for production of the same amount of output. Rule of thumb $n \geq \max\{k \times m, 3(k+m)\}$, which can provide guidance to choose a number of DMUs, is satisfied.

Efficiency can be decomposed into technical and scale. This provides valuable information on the sources of inefficiency, that can be either the transformation process of inputs to outputs, or small scale of operations, or both. Constant return-to-scale (CRS) model represents global technical efficiency of the DMU. Variable return to scale (VRS) model is used to get local technical efficiency. Scale efficiency (SE) can be obtained by relating CRS scores to VRS scores: $SE_l = CRS_l/VRS_l$. All these data are presented in Table 5.

Table 5 also lists the evaluation of the budget, the final rank at the end of the season 2015/2016 and the average attendance. As can be seen from the data presented, the financial resources do not determine the final grade, and it has no effect on attendance. Nevertheless, the study of the effectiveness at the various stages of the production process can explain the reasons for the successes and failures of football clubs.

For example, CSKA effectively spends the funds for the purchase of skilled players, but has problems with building up a competitive team, inefficiency on second stage of production process is caused both by inefficient operation (CRS score) and by operating on a sub-optimal scale (SE score). Most likely, this is due to the insufficient number of players (no equal substitution for injured players).Besides, this team effectively achieved sport results (1st place in RFPL), but has a problem to transform it in a political/social outcome. Inefficiency of this transformation is caused by operation, the scale of production is almost optimal. We can recommend the club to draw attention to the second phase of the production process - the formation of a competitive team of skilled players. The current position of the club in season 2016/2017 confirms such risks and recommendations. Secondly, the club should pay attention to negotiation with fans. It has a relatively stable fan base, but it should be increased in order to achieve efficiency at the fourth stage.

In season 2015/2016, Rostov demonstrated the phenomenal results. With a modest budget, this team had a chance to become a champion until the last round. According to Table 5, it is achieved by high efficiency at all stages of the production process, except last, where it has the same problem as CSKA, lack of transformation of sportive results to the political/social outcome.

Zenith has the largest budget in RFPL - more than twice than the budget of the champion - CSKA. The main problem of this club with best players in league is the transformation of team's opportunities in sport results, it shows worst performance on second stage of production in the League.It could be explained by low motivation of players in domestic championship. Still, the achievements in international tournaments in recent years are also absent.

The analysis has shown that in general all teams have a sufficiently good scale efficiency except four teams with largest budget (Zenith, Spartak, Locomotiv, and CSKA) on the second stage of production process. That means that their problems are not limited to production process (low CRS) they do not use the resources properly (low SE). This finding requires more detail research, including the investigation of structure and processes of leading foreign clubs.

The problem of transformation of team's opportunities in sport results could be considered the most important for majority of RFPL clubs. Only 3 of 16 teams have corresponding operational efficiency (CRS on second stage) of more than 0.8. More often it is explained by the disproportionately high salaries of players in Russia, as well as the restriction on the number of players with foreign citizenship on the pitch (up to 6), both factors lead to lack of motivation. However, this issue requires further research involving quantitative methods.

As discussed earlier, a key feature of DEA states that the efficient frontier is formed by the best-performing units. This feature can be a source of a problem, because there is no direct way of assessing whether a DMU's deviation from the frontier is statistically significant or not. The principal causes of model misspecification in DEA are: (1) the omission of relevant variables, (2) inclusion of irrelevant variables and (3) incorrect assumption on returns-on-scale. Hence, the robustness of the DEA results should be tested using some form of sensitivity analysis.

We used theoretical analysis of production process and PLS-SEM to confirm the relevance of inputs and outputs. The robustness of the DEA results can be conducted by omitting an input or output variables and studying the results (Ramanathan (2003)). Such analysis has shown no dramatic changes in the efficiency pattern. Finally two models that we used (CRS and VRS) produce the similar distribution of efficiency scores.

6 Conclusion and future work

The research contains the methodology aimed for efficiency analysis of football clubs, comprising the following steps: (1) theoretical analyses of production processes in football; (2) its empirical evidence based on structure modelling applying PLS-SEM; (3) calculating the efficiency on different stages of production process using Data Envelopment Analysis (DEA). The methodology was applied for clubs of Russian Football Premier League. This approach can help football clubs to identify respective weaknesses and focus on efficiency-enhancing strategies.

Further research will be focused on quantitative analysis of production processes in different national leagues using the proposed methodology. The differences in the production processes of football clubs in various countries could be considered perspective as well. The result of this work will be presented in the form of recommendations intended for changes in the institutional framework of Russian football in order to increase its competitiveness in the international arena.

Table 1: The models developed for measuring the efficiency of football clubs

Reference	Object	Inputs	Outputs
Haas (2003)	English Premier League clubs in the 2000/2001 season	Total wages and salaries (excl. coach); coach salary; home town population.	Points; spectators; revenue; international results (whether a team had participated in international competition in 2000/2001)
Barros and Leach (2006)	English Premier League clubs from 1998/99 to 2002/03 seasons	Number of players; wages; net assets and stadium facilities expenditure	Points obtained in the season; attendance; turnover.
Garcia-Sanchez (2007)	First Division of Spanish Football League during the 2002/2003–2004/2005 seasons	Offence (attacking moves, passes to the penalty area and shots at goal); defence (ball recovery and goalkeeper's actions)	The number of spectators who attended the matches played home
Bosca et al. (2009)	Italian and Spanish football during three seasons (2000/2001–2002/2003)	Offensive inputs: shots-on-goal, minutes of possession, etc.; Defensive inputs: the inverse of shots-at-goal made by opposing team, etc.	Offensive output: number of goals scored over the course of the season; Defensive output: inverse of the number of goals conceded by a team.
Kulikova and Goshunova (2014)	51 professional football clubs from Brazil, England, France, Germany, Italy, Netherlands, etc.	Total costs; Players' registrations; Borrowed capital; Personnel costs; Average number of playing staff; Number of points scored in national championship.	Turnover which reflects financial efficiency; Rank in the national championship, efficiency of sports activity.
Roboredo et al. (2015)	Brazilian football teams in the season 2014.	The number of home matches, the average attendance and the average points obtained in the last four seasons.	Total points obtained at the season 2014.
Halkos and Tzeremes (2013)	Top 25 European Football Clubs.	Football clubs' revenues; current value and debt.	Composite output that measures football clubs' European and domestic trophies.
Bi et al. (2015)	British Premier League for the 20002001 season.	Total wages and salaries (except the coach's salary) and home town population.	Points, spectators, and revenue.
Espitia-Escuer and Garcia-Cebrian (2010)	Champions League from 2003 to 2007.	Number of players throughout the length of the season; the number of attacking moves; the number of shots.	Games played.
Petrovic Djordjevic et al. (2015)	National football teams in the qualifications for 2010 FIFA World Cup.	Tactical and technical characteristics (passes, shots in target).	Total number of scored goals.
Kern et al. (2013)	English Premier League seasons 2006/07 to 2008/09.	Wage costs; net transfer activity; market value.	Points won within one season; total revenue; attendances.
Espitia-Escuer and Garcia-Cebrian (2016)	UEFA Champions League between 2003 and 2012.	Assists; corners; penalties; shots, etc.	Number of games played.
Pyatunin et al. (2016)	48 big European football clubs.	Staff costs; market value of squad; country strength coefficient; participating in the European Cups.	Revenues; points per a game; qualification for the European Cups for the next season; prize money for sport performance in a European Cup.
Barros and Douvis (2009)	Portugal and Greece clubs for the period 1999/2000 to 2002/2003.	Number of players; total costs.	Total receipt; points won; total attendance.

Table 2: Latent variables describing the production process of football club and measurable indicators

Latent variable	Indicator	Description	References
FINRES *Financial resources*	BUDGET	Expert appraisal of spending, m$, Source: www.sports.ru	Barros and Douvis (2009)
	TOTMARKTV	Market value of squad, m$, Source: www.championat.com	Kern et al. (2013)
STRPLS *Players' skills*	AVGVALUE	Average value of the players, participated in official matches, m$	Baroncelli and Lago (2006)
	NATTEAM	Number of players participated in the national team during season.Source: www.championat.com	Baroncelli and Lago (2006)
COMPTEAM *Competitive team*	ATTACK	Number of goals scored during the season. Source: www.rfpl.org	Bosca et al. (2009)
	NDEF	Number of conceded goals during the season (negative value) Source: www.rfpl.org	Bosca et al. (2009)
SPORTRES *Sport results*	POINTS	Number of points. Source: www.rfpl.org	Haas (2003)
	WINS	Number of wins. Source: www.rfpl.org	Garcia-Sanchez (2007)
	DREAMT	Number of entering the symbolic tour team. Source: www.championat.com	Baroncelli and Lago (2006)
POLRES *Political outcome*	ATTHOM	Attendance of home matches. Source: www.championat.com	Haas (2003)
	ATTTOT	Total attendance of home and away matches. Source: www.championat.com	Haas (2003)

Table 3: Statistics for seasons 2012/2013 - 2015/2016

Indicator	Mean value	Median	Min value	Max value	Std. dev.	Kurtosis	Skewness
ATTACK	37.672	36	19	67	11.758	-0.625	0.479
ATTHOM	169811	161700	10616	377683	72642	0.827	0.686
ATTTOT	342921	324694	160621	621697	98614	0.721	0.892
AVGVALUE	3.555	2.292	0.333	13.6	3.212	1.254	1.304
BUDGET	74.367	42.5	6.50	300	66.847	1.990	1.478
DREAMT	19.781	17.5	6	49	9.967	-0.235	0.726
NATTEAM	2,031	1	0	9	2.507	0.117	1.124
NDEF	-37.672	-39	-65	-17	9.517	0.010	-0.222
POINTS	41.203	38.5	19	67	13.500	-1.070	0.262
TOTMARKTV	64.733	39.1	7	224.2	56.547	0.244	1.094
WINS	11.203	10	3	20	4.791	-1.030	0.318

Table 4: Reliability, convergent validity and discriminant validity of the model

Latent variable	Correlation of latent variables					CR	AVE
	COMPTEAM	FINRES	POLRES	SPORTRES	STRPLS		
COMPTEAM	*0.893*					0.887	0.798
FINRES	0.774	*0.974*				0.974	0.949
POLRES	0.501	0.570	*0.972*			0.972	0.945
SPORTRES	0.836	0.741	0.500	*0.980*		0.986	0.960
STRPLS	0.786	0.910	0.521	0.771	*0.947*	0.947	0.898

Table 5: Efficiency of Russian football clubs on different stages of production process

Team	Efficiency of transformation												Rank	Budget, m$	Average attendace
	FINRES-STRPLS			STRPLS-COMPTEAM			COMPTEAM-SPORTRES			SPORTES-POLRES					
	CRS	VRS	SE	CRS	VRS	SE	CRS	VRS	SE	CRS	VRS	SE			
CSKA	1	1	1	0.18	0.48	0.37	1	1	1	0.47	0.49	0.96	1	80	9591
Rostov	0.82	0.99	0.84	1	1	1	1	1	1	0.42	0.50	0.85	2	30	13334
Zenith	1	1	1	0.15	1	0.15	0.70	0.70	1	0.65	0.66	0.99	3	185	16813
Krasnodar	0.96	0.99	0.97	1	1	1	0.71	0.72	0.99	0.45	0.48	0.94	4	75	10272
Spartak	0.88	0.92	0.95	0.28	0.81	0.34	0.69	1	0.69	1	1	1	5	120	25179
Locomotiv	0.92	0.95	0.97	0.26	0.39	0.66	0.77	0.77	1	0.57	0.59	0.96	6	90	9815
Terek	0.77	0.97	0.79	0.58	0.61	0.95	0.74	0.74	0.99	0.85	0.86	0.99	7	30	16251
Ural	0.86	1	0.86	0.80	0.97	0.83	0.54	0.57	0.96	0.65	0.80	0.81	8	15	5553
Krylya Sovetov	0.86	1	0.86	0.33	0.48	0.70	1	1	1	0.79	0.79	1	9	15	11125
Rubin	0.70	0.77	0.91	0.39	0.45	0.88	0.58	0.60	0.96	0.84	0.88	0.96	10	60	11871
Amkar	0.64	1	0.64	1	1	1	0.76	0.86	0.89	0.86	1	0.86	11	13	8059
Ufa	0.62	0.87	0.71	0.80	0.88	0.91	0.77	0.87	0.88	0.78	0.93	0.84	12	15	7059
Anji	0.67	0.83	0.81	0.59	0.69	0.85	0.71	0.80	0.88	1	1	1	13	25	9977
Kuban	1	1	1	0.31	0.37	0.84	0.42	0.56	0.75	1	1	1	14	21	9464
Dynamo	0.75	0.80	0.94	0.18	0.20	0.91	1	1	1	0.95	1	0.95	15	55	6335
Mordovia	0.76	1	0.76	0.76	0.93	0.83	0.51	0.66	0.77	0.90	1	0.90	16	13	5377

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