

## EFFICIENCY OF FOOTBALL CLUBS IN POLAND

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### Abstract

This article evaluates the diversity in the level of efficiency of football clubs which played matches in the top-level football league in Poland in the 2014/2015 season – the Polish First Division (Ekstraklasa). The efficiency was measured with the use of the non-parametric method of frontier data analysis (*DEA – Data Envelopment Analysis*). The results of the measurement indicate that the efficiency of the Polish First Division varies widely. More than one-third of clubs (inefficient ones) incur excessively high expenditures (salaries) in relation to the actually produced output. The study found that the technology of efficient clubs is based, first of all, on generating much higher revenues in relation to the players' salary costs. This allows the efficient clubs to more effectively (in comparison to non-efficient clubs) convert their input into output. Identifying the differences in efficiency using established benchmarking factors resulted in determining the optimum input levels for inefficient clubs and indicating the clubs where activities to improve efficiency should be undertaken. The result of the research is an efficiency ranking order for the football clubs covered by the analysis.

## EFEKTYWNOŚĆ FUNKCJONOWANIA KLUBÓW PIŁKI NOŻNEJ W POLSCE

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**Słowa kluczowe:** DEA (*data envelopment analysis*), efektywność techniczna, kluby sportowe.

### Abstract

Celem artykułu jest ocena stopnia zróżnicowania poziomu efektywności funkcjonowania klubów piłki nożnej, które w sezonie 2014/2015 rozgrywały mecze na najwyższym poziomie rozgrywek w Polsce – w Ekstraklasie. Efektywność mierzono na podstawie nieparametrycznej metody granicznej analizy danych (*DEA – Data Envelopment Analysis*). Wyniki pomiaru wskazują, że efektywność funkcjonowania klubów z Ekstraklasy jest silnie zróżnicowana. Ponad jedna trzecia klubów (nieefektywnych) ponosi zbyt wysokie nakłady (wynagrodzenia) w stosunku do faktycznie osiągniętych

rezultatów. Z przeprowadzonych badań wynika, że technologia klubów efektywnych opiera się przede wszystkim na generowaniu znacznie wyższych przychodów w stosunku do kosztów wynagrodzeń zawodników. Pozwala to klubom efektywnym na sprawniejsze w porównaniu z nieefektywnymi przekształcenie nakładów w rezultaty. Identyfikując różnice w efektywności na wysokości ustalonych współczynników benchmarkingowych, wyznaczono optymalne wielkości nakładów dla klubów nieefektywnych oraz wskazano, w których z nich powinno się podjąć działania zmierzające do poprawy efektywności ich funkcjonowania. Konsekwencją przeprowadzonych badań jest ustalenie kolejności objętych badaniami klubów piłki nożnej w rankingu efektywności.

## Introduction

In the theory of economics, efficiency evaluation and measurement are key issues for each organization, regardless of whether it is a producer of goods and services or a sports organization. In particular, measuring the efficiency of professional sports clubs makes it possible to evaluate their own achievements against other clubs performing in the sports market. It seems important to undertake this subject matter in view of the economic and social importance of sports and the trend towards professionalization and commercialization in Poland. Sports clubs are transforming into enterprises which have to ensure the economic efficiency of their operations. The significance of the issue of efficiency and good financial condition of football clubs is proven by the Financial Fair Play<sup>1</sup> initiative undertaken in 2009 by the Union of European Football Associations (UEFA). Its aim has been to improve financial efficiency of football clubs in Europe. In Polish economic practice, evaluations of football club efficiency most often use methods based on ratio analysis. An evaluation and comparison of clubs from the Polish First Division is performed by two financial institutions, i.e. Deloitte and Ernst & Young (EY). Every year, based on the data concerning the financial situation, sports results, advertising and sponsoring activity and other criteria, financial institutions prepare club rankings. However, it quite often turns out that an efficiency evaluation based on ratios is insufficient. Sports clubs are unique organizations, differing from other enterprises producing various goods and services in their operation, legal form, organizational structure and range of activities. Clubs, particularly operating in the form of companies, must strive towards realization of both sports and economic aims (SZNAJDER 2012). In order to reliably examine the business reality characterizing the operations of sports club, it is necessary to develop and apply new methods to evaluate efficiency, particularly derived from such disciplines as statistics, econometrics and operations research. The Polish literature on the subject lacks analyses and publications which use

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<sup>1</sup> UEFA statement on financial fair play, online: <http://www.uefa.com/uefa/footballfirst/protectingthegame/financialfairplay/news/newsid=1590370.html> (access: 10.03.2015).

quantitative – non-parametric and parametric- methods to evaluate the efficiency of sports organizations. The application of such methods helps to investigate the economic and financial situation, taking into account the multiple dimensions of activities undertaken by a sports club. For instance, the non-parametric DEA (*Data Envelopment Analysis*) method was applied to evaluate the efficiency of clubs playing in the following football leagues in the world: Major League Soccer (HAAS 2003a) and the English (HAAS 2003b) and BARROS and LEACH (2006a), Spanish (GONZALEZ-GOMEZ, PICAZO-TADEO 2010), German (HAAS et al. 2004), French (JARDIN 2009) and Brazilian (BARROS et al. 2010) leagues. The results of research concerning efficiency of sports clubs using parametric methods are also available, e.g. in BARROS and LEACH (2006b) and HOFLE and PAYNE (1997). The researchers determined the efficiency of the English Premier League clubs and the US National Football League (NFL) using a Cobb-Douglas function. On the other hand, DAWSON et al. (2000) and BARROS and GARCIA-DEL-BARRIO (2008) applied a stochastic frontier analysis (*SFA – Stochastic Frontier Approach*) to determine the efficiency of English football clubs.

This article evaluated the degree of diversity in the efficiency level of football clubs whose teams participated in the 2014/2015 season in the top-level football competition in Poland, namely, the Polish First Division (Ekstraklasa). The term efficiency used in the article should be understood as the so-called technical (technological) efficiency, defined as the skill in converting the consumed inputs into economic and sportive output (results).

## Research methods, construction and data

In order to evaluate the technical efficiency of football clubs, the following DEA models were applied<sup>2</sup>: with constant returns-to-scale (known as CCR, after the authors' names: Charnes, Cooper, Rhodes) and variable returns-to-scale (known as BCC, after the authors' names: Banker, Charnes, Cooper). Solving a CCR model leads to obtaining overall efficiency, while solving a BCC model results in obtaining the pure technical efficiency of a given unit. Models selected for the analysis are input-oriented, where the aim is to minimize them without affecting the outputs. They were chosen in order to present the possibilities of reducing expenditures incurred by individual football clubs without the need to apply additional means to change the level of the results achieved. In business practice, sport club managers have a higher impact on

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<sup>2</sup> A description of the DEA method and the criterion of efficiency evaluation of the examined objects are available, e.g. in the following publications: for CCR model – CHARNES et al. (1978, p. 429–444), BCC – BANKER et al. (1984, p. 1078–1092).

input reduction, mainly regarding the costs of staff (players and coaches) salaries than on an increase in the output obtained, for instance, the number of points awarded for winning or drawing in a football match. Input amounts are basic variables affecting their decisions and their amount can be optimized only in an input-oriented approach.

The DEA methods do not require knowledge of the form of the efficiency function. By applying empirical values of variables in the form of inputs and outputs, we look for weights to maximise their efficiency (for a given DMU – *Decision Making Unit*). Thus, we receive a mathematical programming task, in which the aim is to determine the efficiency of objects in relation to their entire group. A graphic illustration of DEA methods is the efficiency curve (best practice frontier), connecting the most effective decision-making units (Fig. 1).

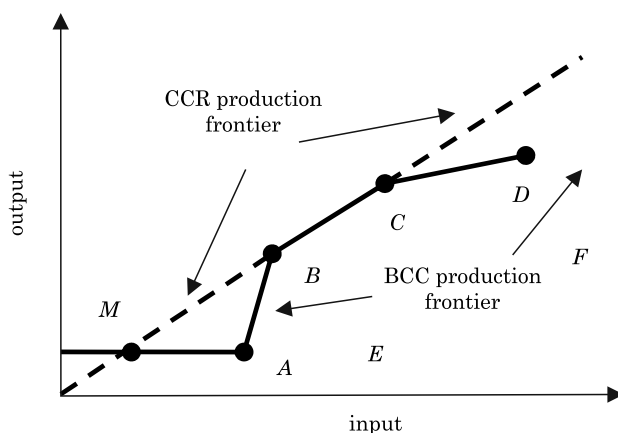


Fig. 1. Overall (CCR) and pure (BCC) technical efficiency curves  
Source: on the basis of COOPER et al. (2006).

The efficiency curve is estimated on the basis of empirical data concerning inputs and outputs. The examined objects (in this case football clubs) are presented as decision making units DMU – A, B, C, D, M – situated on the efficiency curve, are considered efficient, and their efficiency ratios are equal to 1 ( $\theta_0=1$ )<sup>3</sup>. On the other hand, units situated below the efficiency curve, with a value of less than one, are considered inefficient ( $\theta_0<1$ ) – these are units E and F.

The total and pure efficiency ratios are also used to determine the scale efficiency. This provides information on how much less input could be used if

<sup>3</sup> In DEA methods, (Farrell) efficiency is usually symbolizes as  $\theta_0$  (theta).

the output amount was optimal. With a BCC efficiency ratio equal to one, a given object is efficient in relation to the scale of involved production factors and when the ratio is less than one, it is inefficient in relation to the scale of involved production factors. Solving the CCR or BCC model does not provide the possibility to establish the ranking of objects and, in particular, the ranking of fully efficient objects with an efficiency ratio equal to one. A relevant suggestion to solving this problem was published by Andersen and Petersen (1993) and Tone (2002)<sup>4</sup>. The CCR model with the so-called „super-efficiency” ranking (SE-CCR) they proposed was used to rank the football clubs from the least to the most efficient.

In order to calculate efficiency ratios, categories of inputs and outputs were selected based on a review of literature concerning research on the efficiency

Table 1  
Categories of inputs and effects of the First Division clubs

Clubs	Costs of salaries (PLN '000)	Revenue incl. transfer activities (PLN '000)	NC+ audience ('000)	Points	Numbers of spectators in the stadium
Lech Poznań	20,679	65,561	166	70	20,261
Legia Warszawa	22,601	115,146	209	70	16,596
Jagiellonia Białystok	7,614	20,468	130	66	10,755
Śląsk Wrocław	10,094	19,469	126	58	10,963
Lechia Gdańsk	15,905	40,433	141	50	16,608
Wisła Kraków	14,340	32,830	161	50	12,159
Górnik Zabrze	15,121	17,213	115	48	2,961
Pogoń Szczecin	7,281	21,556	119	43	6,101
Cracovia Kraków	10,102	26,976	114	55	6,674
Ruch Chorzów	10,565	17,318	116	47	5,994
Korona Kielce	12,811	12,957	127	48	6,286
Piast Gliwice	8,496	12,662	109	48	4,593
Podbeskidzie Bielsko-Biała	3,334	11,491	101	47	3,958
Górnik Łęczna	6,134	10,974	109	44	4,163
Zawisza Bydgoszcz	7,020	12,554	92	39	2,775
GKS Bełchatów	4,335	16,407	110	37	3,051

Source: Data and own calculations on the basis of the report entitled *Ekstraklasa piłkarskiego biznesu*, online (access: 10.03.2015).

<sup>4</sup> A detailed description of the SE-CCR model methodology is available in publications, e.g. by ANDERSEN, PETERSEN (1993, p. 1261–1264), TONE (2002, p. 32–41), GUZIK (2008, p. 15–29).

of football clubs in the world<sup>5</sup> and the production model for a professional sports club proposed by BARONCELLI and LAGO (2006). One variable determining input category was assumed, i.e. costs of players' salaries<sup>6</sup>. The outputs included four categories of variables: number of points awarded the end of the league season<sup>7</sup>, revenues, including revenues from transfer activities, average audience watching matches in NC+ TV channel and average number of spectators present in the stadium during football matches. Input and output categories assumed for the research are presented in Table 1.

A Spearman's rank correlation was applied to determine the correlation between the ratios presenting the share of costs of salaries in revenues and points gained by clubs in league competitions and the technical efficiency ratios calculated with the DEA method. The choice of variables to be analysed was determined by the availability of information concerning football clubs. The data used in the analyses originated from a report prepared and published online by Ernst & Young, entitled *Ekstraklasa piłkarskiego biznesu* (online).

## **Evaluation and comparison of the efficiency of the Polish First Division clubs and possibilities of its improvement**

The ranking of clubs in the Polish First Division in the league table at the end of the 2014/2015 season, values of efficiency ratios and lambda  $\lambda_{oj}$  benchmark formulae (coefficients) (calculated for the CCR model)<sup>8</sup> are presented in Table 2.

On the basis of the research conducted, it was found that in the 2014/2015 season of the Polish First Division football competitions, the following clubs were fully efficient (in the CCR model): Legia Warszawa, Jagiellonia Białystok and Podbeskidzie Bielsko-Biała. The value of the efficiency ratio for the above-mentioned clubs is 1 (100%), which means that they are efficient, both in the technology and scale of the output generated. Taking into account the values of overall technical efficiency below one and pure efficiency amounting

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<sup>5</sup> For example, HAAS (2003a, p. 2010 and 2003b, p. 406), applying the DEA method to determine Major League Soccer and English Premier League clubs analysed the following types of input categories: wages of players, coaches, coaching staff, population in the town where the club was based, and the following outputs: number of points awarded, total audience in a league season, stadium utilization and revenues of sports clubs.

<sup>6</sup> Costs of wages were calculated on the basis of the amount of costs of players' salaries per each point awarded and the total number of points gathered in a season by the football club.

<sup>7</sup> The number includes all points gained by the club, taking into account the division of points (the so-called ESA 37)

<sup>8</sup> Benchmark formulae for ineffective  $o^{\text{th}}$  objects are described by optimum coefficients  $\lambda_{oj}$  ( $j = 1, \dots, J$ ). They provide the multiplicity of the  $j^{\text{th}}$  object technology that should be assumed when constructing an optimum technology of the  $o^{\text{th}}$  object.

Table 2  
Results of the evaluation of technical efficiency of the Polish First Division clubs in the season 2014/2015

Clubs	Place in ranking	CCR	BCC	Scale efficiency	$\lambda_{oj}$ (CCR) benchmark formulae
Lech Poznań	1	0.86	1.00	0.86	$\lambda_2=0.32, \lambda_3=1.39$
Legia Warszawa	2	1.00	1.00	1.00	$\lambda_2=1$
Jagiellonia Białystok	3	1.00	1.00	1.00	$\lambda_3=1$
Śląsk Wrocław	4	0.77	0.78	0.77	$\lambda_3=1.02$
Lechia Gdańsk	5	0.81	0.98	0.81	$\lambda_2=0.11, \lambda_3=1.38$
Wisła Kraków	6	0.69	0.94	0.69	$\lambda_2=0.10, \lambda_3=0.88, \lambda_{13}=0.25$
Górnik Zabrze	7	0.30	0.34	0.30	$\lambda_2=0.05, \lambda_{13}=1.05$
Pogoń Szczecin	8	0.77	0.82	0.77	$\lambda_2=0.10, \lambda_3=0.88, \lambda_{13}=0.25$
Cracovia Kraków	9	0.65	0.75	0.65	$\lambda_2=0.12, \lambda_3=0.03, \lambda_{13}=1.10$
Ruch Chorzów	10	0.48	0.51	0.48	$\lambda_2=0.03, \lambda_3=0.21, \lambda_{13}=0.81$
Korona Kielce	11	0.39	0.56	0.39	$\lambda_3=0.23, \lambda_{13}=0.96$
Piast Gliwice	12	0.45	0.52	0.45	$\lambda_3=0.06, \lambda_{13}=1.01$
Podbeskidzie Bielsko-Biała	13	1.00	1.00	1.00	$\lambda_{13}=1$
Górnik Łęczna	14	0.59	0.72	0.59	$\lambda_{13}=1.08$
Zawisza Bydgoszcz	15	0.48	0.50	0.50	$\lambda_2=0.02, \lambda_{13}=0.86$
GKS Bełchatów	16	0.99	1.00	0.99	$\lambda_2=0.04, \lambda_{13}=1.00$

Source: own study.

to one, Lech Poznań and GKS Bełchatów are technologically efficient with the assumption of variable returns-to-scale. In view of the situation where the efficiency (or inefficiency) of those clubs (assuming constant and variable effects) is not consistent, scale efficiency was also determined (Tab. 2). This helped to determine how much less input could be used if the amount of output was optimal. The scale efficiency measure had values of less than one, which suggests that those clubs were ineffective in relation to the scale of the resources involved. The least efficient clubs in the Polish First Division are Górnik Zabrze and Korona Kielce, with overall technical efficiency (CCR) values of only 0.34 and 0.39 (Tab. 2), respectively. This indicates the need to restructure the costs of wages in clubs from Zabrze and Kielce.

The results of the research presented so far helped, first of all, to distinguish efficient and inefficient clubs. However, they do not provide the possibility of specifying the exact ranking of clubs in terms of the efficiency level achieved (in relation to units considered efficient in the group). Such a possibility is provided by applying the SE-CCR model. The obtained values of efficiency ratios calculated on the basis of this model offer a basis to present the ranking of clubs in order from the most efficient to the least efficient, as shown in Figure 2.

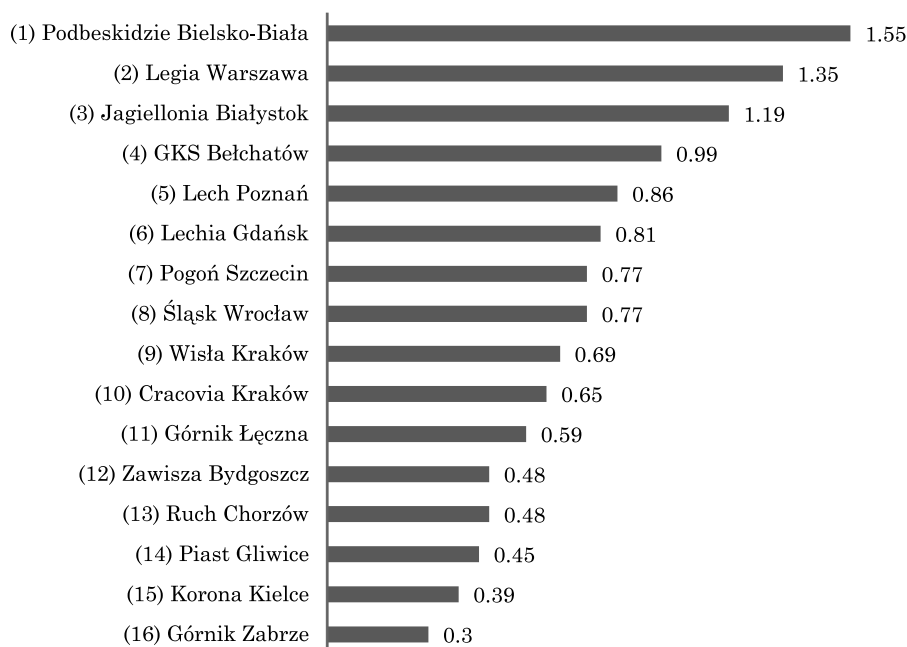


Fig. 2. Ranking of the Polish First Division football clubs in terms of their efficiency (SE-CCR model)  
Source: own study.

In the group of 16 clubs of the Polish football First Division, Podbeskidzie Bielsko-Biała proved to be the most efficient club. To achieve its results (revenues, number of points, TV audience and number of spectators in the stadium), the club from Bielsko-Biała needs nearly 1.6 times less input than other clubs using their optimum common technology. Competitors of Jagiellonia (the weakest club among those characterized by 100% efficiency) would have to incur expenditures only 2–6% higher than the input actually made by this club to reach their objectives. Other clubs are not efficient, since their efficiency ratios (ranking coefficients) are below one. The lowest efficiency rankings were found for clubs from Zabrze, Kielce, Gliwice and Bydgoszcz. Competitors of the least effective club of the Polish First Division, Górnik Zabrze, could have had the same results as Górnik Zabrze with using only about 30% of the actual expenditures of this club.

On the basis of the efficiency measurement, it is possible to establish an excess (surplus) of players' salaries in relation to the actual demand that would have ensured the efficient operation of a football club, with the assumption of constant outputs. Taking all of this into consideration, the calculated efficiency measures for individual sports clubs were used for sample determination of the



optimum amount of salaries and, at the same time, for indicating the possibilities for improving the operations of clubs identified as inefficient (Tab. 3).

Results of salary cost optimization for inefficient clubs

Table 3

Clubs	Actual costs of salaries [PLN '000]	Optimum costs of salaries [PLN '000]	Cost reduction percentage [%]
Górnik Zabrze	15,121	4,536	70
Korona Kielce	12,811	4,996	61
Piast Gliwice	8,496	3,823	55
Zawisza Bydgoszcz	7,020	3,370	52
Ruch Chorzów	10,565	5,071	52
Górnik Łęczna	6,134	3,619	41
Cracovia Kraków	10,102	6,566	35
Wisła Kraków	14,340	9,895	31
Śląsk Wrocław	10,094	7,772	23
Pogoń Szczecin	7,281	5,606	23
Lechia Gdańsk	15,905	12,883	19
Lech Poznań	20,679	17,784	14
GKS Bełchatów	4,335	4,292	1

Source: own study.

The results of the least efficient clubs, i.e. Górnik Zabrze, Korona Kielce, Piast Gliwice, Zawisza Bydgoszcz and Ruch Chorzów, suggest the need to reduce the amount of salaries paid by 52% – 70%, taking into account the scale of achieved outputs and the optimal consumption of resources used for that purpose. The clubs whose technologies can be adopted by inefficient clubs ( $\lambda_{oj}$  benchmarking formulae – Tab. 2) include Legia, Jagiellonia and Podbeskidzie. They occur in most formulae for ineffective clubs with the application of the CCR model.

The efficiency of resource allocation can be proven by the high differentiation of players' salaries costs as calculated per each point gained by football clubs in the 2014/2015 season, as shown in Figure 3.

Definitely the lowest cost per one league point was recorded for Podbeskidzie Bielsko-Biała (PLN 71,000). Relatively low costs in comparison to other clubs were also observed for Jagiellonia Białystok (PLN 115,000) and GKS Bełchatów (PLN 117,000). The three above-mentioned clubs can therefore be considered as demonstrating the highest allocation efficiency of the resources owned. The highest costs of salaries per point awarded were clearly observed in three clubs, Legia Warszawa, Lechia Gdańsk and Górnik Zabrze. They amount

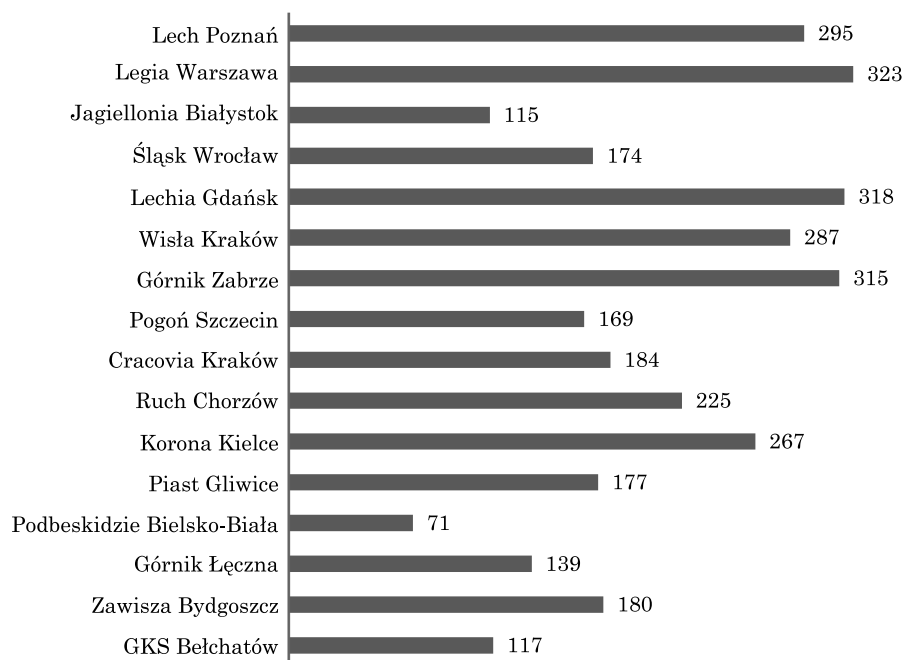


Fig. 3. Costs of players' salaries per each point gained by the Polish First Division clubs (PLN '000/one point)

Source: Own study

to PLN 323,000, PLN 318,000 and PLN 315,000, respectively. For the other clubs, the costs under analysis amounted from 139,000 for Górnik Łęczna to PLN 295,000 for Lech Poznań.

Apart from the cost of a point gained in the league, a significant element of the picture of efficiency of professional sports clubs is a comparison of the relationship between the amount of costs, mainly staff costs (salaries for players and coaching staff) and the revenue generated. According to the idea of Financial Fair Play introduced in 2008 by the Union of European Football Association, the costs of clubs (participating in competitions of European leagues) should not be higher than the revenues achieved. Exceeding this limit is related, first of all, to high expenditures incurred for player transfers and staff salary costs. If sporting or economic results are not achieved, such a situation could contribute to the loss of stability and financial security of the club. Consequently, indicators presenting the relationship between the players' salaries and revenues were calculated for the clubs of the Polish First Division, as presented in Figure 4.

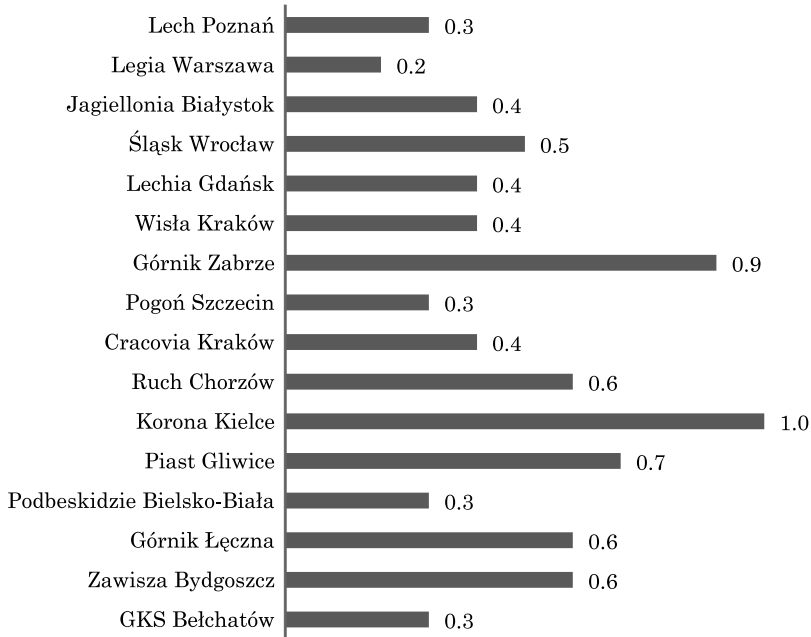


Fig. 4. Value of the salary costs-to-revenues ratio for the Polish First Division clubs  
Source: own study.

Among the 16 clubs under analysis, the lowest salary costs in relation to revenues were found for Legia Warszawa. For the club from the capital city, costs are more than five times lower than revenues. A low salary-to-revenues ratio (0.3) was also observed for clubs from Bełchatów, Bielsko-Biała and Poznań. Definitely the highest share of this ratio was found for clubs from Zabrze and Kielce, where salary costs equalled revenues. In view of the fact that, apart from salaries for players, there are also other types of costs (such as salaries for coaching staff and operating costs related to the maintenance of current operations and other costs) it should be assumed that the total amount of costs in the above-mentioned two clubs significantly exceeds the revenues gained.

The observed differentiation in the level of salaries in individual clubs proves that efficiency depends on the number of points gained at the end of the league season and the amount of revenue that is directly related to the number of spectators in the stadium and in front of a TV. In order to determine the relationship between the cost of one league point, the cost-to-revenues ratio and the technical efficiency ratio, the following correlation was determined (Tab. 4).

Table 4

Correlations between salary costs/points and salary costs/revenues ratios and technical efficiency ratios

Specification	CCR	BCC
Salary costs/points ratio	-0.25	-0.17
Salary costs/revenues ratio	-0.93*	-0.90*

\* Correlation coefficient is significant at  $p < 0.05$

Source: own study.

The results of the correlation analysis show a significant correlation ( $p < 0.05$ ) between salary costs/points and salary costs/revenues ratios and efficiency ratios. This means that an increase in salary costs in relation to revenue and points involves a decrease in the value of efficiency ratios. However, it should be emphasized that when comparing the values of two indicators with the efficiency of clubs in the Polish First Division, it is not the salary-to-points ratio that has the largest effect on the efficiency level. Although the highest cost per point was observed for Legia, it is an efficient club. Legia achieves good results due to use of technology which generates high revenues in relation to the incurred costs of players' salaries. This effect is also enhanced by other outputs produced in the season under examination: the largest audience watching matches on TV and a high number of spectators at the stadium. The technology of the most efficient club in the Polish First Division (Podbeskidzie) is based on the lowest (in comparison to all other clubs) cost of a league point awarded and a low share of salary costs in relation to revenues. As regards achieving sport results, clubs from Poznań, Warszawa and Białystok occupy the three top positions among all efficient units in the league table at the end of the 2014/2015 season. On the other hand, clubs from Bielsko-Biała and Bełchatów, in spite of being efficient, are ranked in the bottom part of the table. For Górnik Zabrze and Korona Kielce, a high cost of a league point was observed along with a high share of salaries in relation to revenues.

## Summary

This study found that the efficiency of clubs varies widely. More than one-third of clubs (ineffective ones) use too high input (salaries) in relation to their achieved output. As the analysis showed, a low share of salaries in relation to revenues is of significant importance for the growth of technical efficiency. This suggests that the technology of efficient clubs is based, first of all, on generating much higher revenues in relation to the costs incurred.

It allows the clubs to convert inputs into outputs more effectively as compared to non-efficient clubs. A high cost per league point affects the diversification of efficiency, but it is not a prerequisite for classifying the club as either effective or ineffective. Despite Legia and Lech having high salaries per point, these clubs are efficient, as they demonstrate higher revenues in comparison to costs. However, it should be emphasized that fully efficient clubs do not always occupy the highest places in the league table. In the Polish league, two clubs, Podbeskidzie and Bełchatów, being efficient teams, are ranked in the bottom of the table. This supports the research of other authors examining other football leagues in the world (KELLER 2008, HAAS 2003a, b, JARDIN 2009, BARROS, LEACH 2006a et al.). Nevertheless, it should be remembered that the research was carried out on a sample of clubs for only one competition season. This is related, first of all, to the availability of information, which clubs in Poland are unwilling to share. Unquestionably, better access to economic and financial data would enrich the analysis of the efficiency of sports clubs in Poland. However, the analysis and observations made in the article can be used as an important signal for sport club managers, as well as for the licensing committee of a sports association issuing a licence for a club to participate in league matches. The data from the ranking prepared with the application of the SE-CCR model could become one of the basic tools for monitoring the financial situation. It is a potential direction of research into the evaluation of sport clubs in the future.

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## References

- ANDERSEN P., PETERSEN N.C. 1993. *A procedure for ranking efficient units in Data Envelopment Analysis*. Management Science, 39(10).
- BANKER R.D., CHARNES A., COOPER W. 1984. *Some models for estimating technical and scale inefficiencies in Data Envelopment Analysis*. Management Science, 30: 1078–1092.
- BARONCELLI A., LAGO U. 2006. *Italian football*. Journal of Sports Economics, 7 (1): 13–28.
- BARROS C.P., GARCIA-DEL-BARRIO P. 2008. *Efficiency measurement of the English football Premier League with a random frontier model*. Economic Modelling, 25(5): 994–1002.
- BARROS C.P., LEACH S. 2006b. *Analysing the performance of the English F.A. Premier League with an econometric frontier model*. Journal of Sport Economics, 7(4): 391–407.
- BARROS C.P., LEACH S. 2006a. *Performance evaluation of the English Premier League with data envelopment analysis*. Applied Economics, 38(12): 1449–1458.
- CHARNES A., COOPER W., RHODES E.L. 1978. *Measuring the Efficiency of Decision Making Units*. European Journal of Operational Research, 2: 429–444.
- COOPER W.W., SEIFORD L.M., TONE K. 2006. *Introduction to Data Envelopment Analysis and Its Uses*. Springer, New York.
- DAWSON P., DOBSON S., GERRARD B. 2000. *Stochastic frontier and the temporal structure of managerial efficiency in English soccer*. Journal of Sports Economics, 1: 341–362.
- Ekstraklasa piłkarskiego biznesu. 2015. <http://www.ey.com/PL/pl/Industries/Media-Entertainment/Ekstraklasa-pilkarskiego-biznesu-2015>.

- GONZALEZ-GOMEZ F., PICAZO-TADEO A.J. 2010. *Can We Be Satisfied with Our Football Team? Evidence from Spanish Professional Football*. Journal of Sports Economics, 11(4).
- GUZIK B. 2008. *Zastosowanie modelu SE-CCR do ustalania struktury i siły konkurencji technologicznej*. Wiadomości Statystyczne, 10: 15–29.
- HAAS D.J. 2003a. *Technical efficiency in the Major League Soccer*. Journal of Sport Economics, 4(3): 203–215.
- HAAS D.J. 2003b. *Productive efficiency of English football teams – a data envelopment approach*. Managerial and Decision Economics, 24: 403–410.
- HAAS D.J., KOCHER M.G., SLITTER M. 2004. *Measuring Efficiency of German Football Teams by Data Envelopment Analysis*. Central European Journal of Operations Research, 12: 251–268.
- HOEFLER R.A., PAYNE J.E. 1997. *Measuring efficiency in the National Basketball Association*. Economics Letters, 55: 293–299.
- JARDIN M. 2009. *Efficiency of French football clubs and its Dynamics*. 23. June. [https://mpa.ub.unimuenchen.de/19828/1/Efficiency\\_of\\_French\\_football\\_clubs\\_and\\_its\\_dynamics.pdf](https://mpa.ub.unimuenchen.de/19828/1/Efficiency_of_French_football_clubs_and_its_dynamics.pdf).
- KELLER C. 2008. *Strategisches Management in Sport*. In: *Management und Marketing in Sport*. Eds. G. Nufer, A. Bühler. Erich Schmidt Verlag, Berlin.
- SZNAJDER A. 2010. *Równowaga sił konkurentów na rynku sportu profesjonalnego*. Gospodarka Narodowa, 4.
- TONE K. 2002. *A slacks based measure of efficiency in Data Envelopment Analysis*. European Journal of Operational Research, 143: 32–41.
- UEFA statement on financial fair play, online: <http://www.uefa.com/uefa/footballfirst/protectingthegame/financialfairplay/news/newsid=1590370.html>.