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**Key factors in the sporting and financial  
success of professional first division  
football clubs in Spain**

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# **KEY FACTORS IN THE SPORTING AND FINANCIAL SUCCESS OF PROFESSIONAL FIRST DIVISION FOOTBALL CLUBS IN SPAIN.**

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## **ABSTRACT**

This article focuses on identifying the sporting and financial variables that explain success both on the field and in the economic management of football teams. This is a relevant topic because modern football has become a multimillion-dollar business, and understanding the keys to success is essential not only for improving sporting performance but also for ensuring the financial stability of clubs.

To simplify the multitude of variables that can affect both sporting and financial performance, Principal Component Analysis (PCA) is used. This method reduces the complexity of the data to just two key factors: the size of the club (measured by variables such as revenue, personnel costs, and market value) and financial performance (based on the Z-score credit evaluation model by Amat & others, 2017, and reflects a synthesis of indicators such as liquidity, debt, and profitability). These two factors are considered the most representative variables for understanding club success. Once these two factors are identified, a regression model is applied to see how size and financial performance influence sporting success, measured by points obtained in the competition.

The analysis shows that the size of the club has a significant relationship with sporting success. In other words, clubs with higher revenue, investment in transfers, and a more valuable squad tend to achieve better results in terms of points. On the other hand, financial performance, while important for the club's economic health, is not a determining factor for short-term sporting success. The study also categorizes clubs into four types: those that achieve both sporting and financial success, those that excel in the sporting arena but have poor financial performance, those with financial success but not sporting success, and those that do not achieve good results either on the field or in economic management. This approach allows for the identification of patterns and trends in the relationship between sporting and financial success, providing a useful tool for analyzing football clubs and their management strategies.

**Keywords:** Sporting success, Economic success, Football clubs, Turnover, Investment in players, Principal Components Analysis, Regression analysis, Spanish first football division

**JEL Codes:** L83, M21, Z20

## 1. INTRODUCTION

Certain sports have long since ceased to be mere sporting events and have become multi-billion euro businesses. In Europe, professional football has undoubtedly undergone the biggest transformation. In the 2022/23 season, European top-flight football revenues grew to 25.6 billion Euros, 7% higher than in the previous season (UEFA 2023). Of the European total, the five major leagues have driven this growth with a turnover of €17.244 billion. In the 2023/2024 season, turnover has continued to grow in double digits for most of the big teams (Football Benchmark, 2024). Thus, for example, Real Madrid reached €830 million, 16% more than the previous year, FC Barcelona €800 million, 26% more and Manchester City €826 million, 13% more.

In parallel to revenue growth, two variables have grown even more strongly, leading many clubs to negative operating results and high levels of net financial debt. On the one hand, the growth in sports personnel costs and, on the other hand, investments in transfers (cost of transfer fees) have, in many cases, outpaced the increase in revenues, eroding the profitability and solvency of the clubs. Considering the two winter and summer windows, transfers reached 9.12 billion Euros in the 2022/23 season (CIES, 2023).

This context led UEFA (2023) in 2010 to develop a Financial Fair Play (FFP) regulation (Athiainen & Jarva, 2022) that establishes, among other regulations, limits on sports salaries in relation to revenue figures in order to safeguard the solvency of clubs while limiting disproportionate investments in transfers that could adulterate the competition. The national regulators of the major leagues have followed the same line. LaLiga, for example, places restrictions on expensive new signings by means of the "Sports Staff Cost Limit" regulation (LaLiga, 2024).

In this context of strong growth in the industry and increasing concentration of turnover and investment in large, mainly European, clubs, success in sporting activity becomes key, not only for reasons of prestige for owners (or members) and fans, but also because sporting success seems to determine the continuity and increase in revenue. Thus, ranking in the national leagues conditions the distribution of television rights, a fundamental component of revenue. Similarly, qualification for the Champions League or UEFA League has direct repercussions in terms of monetary compensation. Each of the 32 clubs that qualified for the group stage of the Champions League 2021/2022 received 15.64 million Euros. The cumulative remuneration for the champion, for all concepts, is close to €100 million Euros.

This situation has led several authors (Andreff, 2007; Fort, 2015; Lang et al, 2011; Sloane 1971) to question whether certain strategic decisions of a sporting nature are not taking precedence over the profitability and solvency of the clubs themselves. In this context, it is important for investors, shareholders and other stakeholders of the clubs to have reliable information on ratios and indicators related to sporting success and economic/financial success and, fundamentally, both.

The aim of this research is, firstly, to identify in the literature the main variables of sporting success and economic/financial performance of professional football clubs and to identify other possible variables, based on market value. These variables will be obtained for a sample of ten seasons of the first division of football in Spain (currently, the EA Sports) between the 2013/2014 and 2022/2023 seasons in order to determine, on the one hand, the correlation of the different variables of economic and financial performance in the achievement of sporting success. In a second phase, given the high co linearity identified, the number of significant variables is reduced to eight: sporting success (Points) is selected as the dependent variable, three of an economic nature relating to the size (Turnover, Staff Costs and Market Value) of the clubs and four relating to financial performance AC/PC (Current Assets / Current Liabilities),

PN/A (Equity / Assets), ROA (Earnings Before Interest and Taxes / Assets) and ROE<sup>3</sup> (EBIT / Equity). Finally, given the interrelationship that still exists between the selected variables, the latent variables SIZE and FINANCIAL PERFORMANCE have been determined by means of Principal Component Analysis (PCA), which, on the one hand, enable a coherent explanation of sporting success measured in points and, on the other hand, make it possible to determine *clusters* or groups of teams with different sporting success and financial performance.

## 2. LITERATURE REVIEW

The conversion of football into a multi-billion Euro business has led to a growing interest in the literature on its different dimensions.

On the one hand, a significant number of authors have focused their attention on the individual performance of football players and its impact in their market value (Transfermarkt, 2023, Poli *et al.*, 2022, Coates & Paskow, 2022, Leone *et al.*, 2019, Müller *et al.*, 2017, among others) or, less abundant due to the difficulty of obtaining reliable information in long series, on the effective price of the federative rights (Poli *et al.*, 2023, 2020, Gallopo & Boido, 2020). Fundamentally, these studies use multiple linear regression, logistic regression, *rain forest* and, more recently, *machine learning* and algorithms as their methodology. This first stream of literature ends with articles focusing on valuation methodology (Amat & Gómez, 2024) and panoramic studies or meta-analyses such as that of Franchesi *et al.* (2023).

These studies, while targeting the professional football player and not the sporting or legal entity (hereafter, the club) can provide the basis for subsequent studies, such as those of Toma & Campobasso (2023), which use these individual variables as a basis and aggregate them to the club level. A sample of the main independent variables used in the literature to predict the market value or the price of players' transfer rights can be found in Amat & Gómez (2024) and Franchesi *et al.* (2023).

The next focus of interest, which is already in line with the aim of this paper, is the study of the relationship between the financial dimension of the club and its sporting performance. A first conclusion on the subject can be found in Szymansky (1998): the performance of a club is reflected in its financial and sporting results. However, this dual objective can be a source of conflict, giving rise to two types of clubs (Osokin, 2018): the "*win maximization club*" and the "*profit maximization club*".

No empirical evidence has been found to give primacy to one strategy over the other. There is, however, a feedback loop that complicates the analysis. The sporting result can be an effect, but also a cause of the economic and financial result, which translates into a virtuous circle (Baroncelli *et al.*, 2004) that is broken, either when the investment in resources (payroll, transfer fees, etc.) systematically exceeds the capacity to generate cash flow, or when the sporting results do not materialize despite the financial effort.

This link between financial and sporting performance and its sometimes perverse outcome has led UEFA, as indicated above, to introduce measures to preserve financial *fair play*. The effectiveness of such measures is the subject of interest of some authors such as Segoviano Pérez (2022) or Fernández (2023) at national level, where the regulations are issued by the respective national regulator, and also at European level (UEFA, 2023).

Another important body of literature, which addresses the subject matter of this paper from different perspectives, is that which focuses on the use of ratios and indicators for the measurement of sport and financial performance. Different contributions can be seen in Figures 1 and 2 below and a summary of the main works consulted is provided in Annex 1.

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<sup>3</sup> The traditional definition of ROE is net income divided by equity. In our sample, especially during the COVID years, several observations had to be discarded as the numerator and denominator were negative, so we chose to use the EBIT/Equity ratio as the dependent variable.

## 2.1. Indicators of sporting success

Sporting success can be defined as the ability of a club to obtain a large number of victories in the competitions in which it participates (Garcia del Barrio & Szymansky, 2009).

The most common indicators in the literature are points or position achieved in the competition. Sometimes modified variables of the monotonically decreasing points ranking as proposed by Dobson and Godard (2001) or their logarithmic transformation according to Szymansky and Kypers (1999) are used to achieve better correlations. On the other hand, it has to be taken into account that if national cup competitions and the UEFA and Champions League are taken into the sample, a point system has to be determined. A proposal on this issue can be found in Barajas *et al.*, 2005.

Likewise, considering the work of Toma & Campobasso (2023) as an example, it is also possible to consider indirect variables of sporting success such as the performance of footballers (goals, passes, etc.) which, subsequently, the authors aggregate at the team level. On the other hand, they measure sporting success directly from the ranking, by quartiles of the teams considering 10 years and the five major leagues. Silva (2015), interested in corporate governance, along with the points weighted by league weight as a variable that directly measures sporting success, considers certain characteristics of the board of directors and the ownership structure of the club as indirect variables.

Figure 1 below summarizes the main indicators of sporting success proposed in the literature.

**Figure 1: Indicators of sporting success.**

Study	Indicator
Toma & Campobasso (2023)	Individual qualitative and sporting performance data of the players and, in a second phase, aggregate data. Team position at the end of the competition in quartiles.
Ahtiainen & Jarva, H. (2022)	Position in the Champions League (1) Position in the national league.
Prayoga <i>et al.</i> (2022)	Points weighted by League weight.
Alaminos (2021)	Points, promotion/descent, Szymanski rating (Szymansky, 1999) among others.
Lepschy <i>et al.</i> (2018)	Goals/attempts, goals, possession, passing, playing home or away.
Galariotis <i>et al.</i> (2017)	Position of the teams in the French Ligue 1.
Silva (2015)	Points weighted by League weight. Characteristics of the Board of Directors. Sport Performance Indicator (1).
Cintia <i>et al.</i> (2015)	Mean and variance of passes as predictors of goals.
Barajas <i>et al.</i> (2005, 2010)	League points, winning percentage, goal difference.
Palacios-Horta (2004)	Goals per game.
Koning <i>et al.</i> (2003)	Average goals for minus goals against.
Marquis (2002)	Winning percentage.

(1) Scoring is established according to the milestone achieved: group stage and different rounds until the final.

(2) Value averaged points in the league, domestic cups and European competitions.

Source: Own elaboration

As can be seen in Figure 1, on the one hand, we find authors who use what we have called indirect variables or ratios: goals per game (Palacios-Huerta, 2004, passes (Cintia *et al.* 2015), average goals scored minus goals conceded (Koning, 2023). On the other hand, there are authors who rely on the winning percentage (Marquis, 2002) or who take the final ranking of the teams in the respective leagues as a reference and therefore use direct variables. As can be seen in Figure 1, the way of measuring sporting performance from Silva (2015) onwards focuses on the points or position of the teams, i.e. on variables that directly measure sporting success.

## 2.2. Financial performance indicators

Indicators of economic success are considered to be those ratios and indicators related to the economic and financial profitability, solvency and short- and long-term survival of football clubs.

Some of the main indicators proposed in the literature are presented in Figure 2 below.

**Figure 2: Financial performance indicators**

Study	Indicator
Toma & Campobasso (2023)	Investment in transfers, team value as the sum of the value of the 20 players with the most minutes played.
Prayoga & Others (2022)	Liquidity (liquidity ratio: current assets/current liabilities), Solvency (debt ratio: debt/assets), Profitability (net profit margin), Share price (1)
Ahtiainen & Jarva (2022)	Operating profit (Earnings before interest and taxes), Earnings before taxes
Alaminos (2021)	Battery of profitability, solvency and liquidity ratios plus ratios related to corporate reputation (e.g. Instagram, Facebook followers, average stadium attendance among others).
Amat & Others (2017)	A Z variable is defined as a predictor of financial default (scoring) based on the ratios CA/CL, E/A, ROA and ROE, with different weights for each of the variables.
Galariotis & Others (2017)	Financial performance: operating margin (operating profit/revenue, net profit on sales, ROE (net profit on equity, ROI (EBITDA/assets), working capital (Long term financing - Non-current assets), indebtedness (debt/equity), autonomy (equity/assets), independence (equity/(equity + long-term debt + long-term provisions))
Ferri & Others (2017)	ROI, Assets, Wages, Size, FCFO, Leverage
Silva (2015)	Earnings per Share, Characteristics of the Board of Directors (2). Ownership model
Ecer & Büyükaslan (2014)	Debt and liquidity ratios
Késenne (2009)	Wages/Sales. Suggested limit 67%.
Barajas & Others (2005, 2010)	Revenues, sports personnel costs, net transfer cost, market.

(1) From listed clubs.

(2) Total number of directors and percentage of independent directors among other governance aspects.

Source: Own elaboration.

Regarding the first meaning of club survival in the short and long term, as can be seen in figure 2, there is a group of authors such as Prayoga *et al.* (2022), Alaminos (2021) Galariotis *et al.* (2017), Ecer & Büyükaslan (2014) who consider, to a greater or lesser extent, the traditional liquidity, debt and profitability ratios in financial analysis with a focus on the balance sheet and results. On the other hand, there is a group of authors who focus primarily on the income statement. In this group are Ahtiainen & Jarva (2022), Barajas *et al.* (2005) and, to some extent, Késene (2009), who focuses on the limit of wages over turnover. Finally, we have indicators relating to investment in transfers and the relative weight of the figures in the overall squad (Toma & Campobasso, 2023), transfer cost or market value (Barajas *et al.*, 2010) and share price or earnings per share in cases where the club is listed on the stock exchange (Silva, 2015).

On the other hand, apart from the traditional approach in the literature described above, it is appropriate to incorporate into the analysis the model of automated credit assessment systems (Scoring) proposed by (Amat & Others, 2017). Using different multivariate and factor analysis techniques, the authors identify four key ratios that make up a Z score with the following components: the liquidity ratio (Current assets / Current liabilities), the debt ratio (Equity / Assets), economic profitability (ROA) and financial profitability (ROE). As will be seen below,

this approach has been adopted to simplify the financial performance of the tangle of financial ratios, which are usually correlated and have little predictive power.

### 3. METHODOLOGY

#### 3.1. Sample

The sample consists of 189 observations corresponding to ten league competitions of the Spanish football first division (laLiga) from the 2013/2014 to the 2022/2023 season. The number of teams included is 30.

Of the 200 potential observations, eleven were eliminated due to unavailability of data or inconsistent ratios (e.g. negative equity and losses cases).

The primary data were obtained mainly from the Iberian Balance Sheet Analysis System (SABI). For those entities for which no information was available, the annual accounts of the clubs were obtained from their corporate website, by direct request to the club in some cases that were not public limited companies, or by request to the Mercantile Register.

Information on market values, market values per field position, market value of the three most valuable players per team and season, as well as the net transfer balance was obtained from Transfermarket (2024).

#### 3.2. Selection of variables

Data were initially collected for twenty-one potential variables, which are detailed in Annex 2. After the preliminary descriptive analysis and the study of the correlation with the POINTS, the variables considered potentially significant were reduced to the seven listed below, together with their main descriptive statistics.

**Table 1: Selected variables and descriptive statistics.**

	Dependent	Financial Variables				Size variables		
STAT.	POINTS	CA/CL	LIABILITIES/ Assets	ROA_EBIT/ Assets	ROE EBIT/E	EXPENDITURE_ON _PERSONAL	VALUE_ MARKET	REVENUE
R	1,00	-0,14	0,02	-0,20	-0,14	0,75	0,79	0,75
$\bar{x}$	52,94	0,88	0,77	0,06	0,26	97,41	242,36	144,50
s	17,29	0,68	0,32	0,16	1,33	123,16	255,34	189,77
Max	94,00	4,13	2,02	0,64	12,64	625,72	1.160,00	836,73
Min	20,00	0,06	0,16	-0,71	-5,81	10,91	7,00	18,07
R: Correlation coefficient, $\bar{x}$ : sample mean, s:standard deviation, Max:maximum, Min:minimum								

Source: Own elaboration

The dependent variable of sporting success chosen was POINTS, which is also one of the most widely used variables in the literature, often taking its logarithm. Likewise, it has been verified that the variable position in the competition offers the same results.

Regarding the independent variables, as can be seen in Table 1, all the size variables correlate very significantly with the variable POINTS, which is consistent with previous studies where turnover or staff costs are frequently used (Barajas, 2005, Szimansky & Kuypers, 1999, Toma & Campobasso, 2023). This study also provides the market value of the team as an indicator of size. The market value, obtained from Transfermarket (2024), corresponds to the sum of the market value of the first team players. It is therefore an enterprise value (EV) that only



considers the value of the squad and does not take into account the reduction in value resulting from the debt that the club may hold. As can be seen in Table 1 above, the market value shows the highest correlation with the points with an  $R=0.79$ , making it a relevant predictive indicator of sporting success.

In most studies, turnover and staff costs tend to be considered as financial variables. As will be seen below, these two variables together with the market value form a dimension of SIZE, which is independent of the financial situation of the club and whose nature is more economic than financial.

The financial variables liquidity (CA/CL), (Equity/Assets) and ROA have been selected taking as a reference the principal components of the Z of the *Scoring* model of Amat & Others (2017) discussed above. The ROE ratio has not been included as some observations were missing in the sample and it was considered that, indirectly, it was already largely represented by the other ratios considered.

Likewise, the low influence of financial ratios on sporting performance can be observed, with correlations between -0.2 and 0.02. However, a first limitation to consider is that teams that have had consistently poor financial ratios over time may have left the competition (and, therefore, disappeared from the sample), either to move to the second division or, in some cases, to enter bankruptcy proceedings. It could also be that the progressive financial deterioration led to a gradual worsening of the points and that this relationship was not captured in the linear models.

Finally, as described in the following section, the independent variables have been simplified by means of Principal Component Analysis (PCA) into two single explanatory factors: SIZE and FINANCIAL PERFORMANCE.

### 3.3. Statistical modeling

Once the descriptive analysis had been carried out (Appendix 2) and the analysis of variables had been reduced to one dependent and seven independent or explanatory variables (Table 1), a Principal Component Analysis (PCA) was carried out for the three variables related to size and the four variables related to financial performance.

PCA is a useful methodology for reducing dimensionality and eliminating co linearity noise by focusing on those variables that explain the greatest variability. On the other hand, reducing the number of variables simplifies interpretation and facilitates the visualization of the data by making it possible to see underlying structures in the data.

The principal components or latent variables with the highest explanatory power of both groups of variables have been denoted as SIZE and FINANCIAL PERFORMANCE. The ultimate purpose of reducing the variables is to enable an explanatory model that avoids redundancies and over-explanations and, on the other hand, to enable clearer and more effective visualizations that reveal relationships between clubs that would otherwise not be possible.

To obtain the graphs of teams by quadrants from the latent variables, we proceeded to obtain the medians of these variables, which were used as abscissa or ordinate axes depending on the concept to be visualized. Depending on their score with respect to the mean or median (depending on the graph), teams have been positioned in the corresponding quadrant.

The R statistical package was used for the statistical calculations.

Finally, based on the variables SIZE and FINANCIAL PERFORMANCE, a model has been designed, using the multiple regression technique (OLS), which explains the POINTS by means of the following linear algebraic expression:

$$\text{POINTS} = \beta_0 + \beta_1 \times \text{SIZE} + \beta_2 \times \text{FINANCIAL\_PERFORMANCE}$$

## 4. RESULTS

### 4.1 Principal Component Analysis (PCA)

#### Analysis of financial performance variables

On the one hand, the co linearity between the selected financial variables has been reduced: liquidity as measured by the CA/CL variable, indebtedness as measured by the E/A variable, and economic performance as measured by the EBIT/ASSETS ratio (ROA) and ROE.

The PCA results for these four variables representing the latent variable size are presented below.

**Table 2: Eigenvalues**

	<b>Dim 1</b>	<b>Dim 2</b>	<b>Dim 3</b>	<b>Dim 4</b>
<b>Variance</b>	1.707	1.018	0,775	0,500
<b>Variance</b>	42,67%	25,45%	19,38%	12.502
<b>Cumulative Variance</b>	42,67%	68,12%	89,50%	100%

Source: Own elaboration with R program

As can be seen in Table 2, the first two components (dimensions) explain almost 70% of the variability and the next two explain the remaining 30%. Therefore, there was autocorrelation between the financial performance variables.

Table 3 presents the contribution of the variables for the two components with the highest significance.

**Table 3: Contribution of the variables to the components**

<b>Variable</b>	<b>Dim 1</b>	<b>Ctr</b>	<b>Cos2</b>	<b>Dim 2</b>	<b>Ctr</b>	<b>cos2</b>
<b>CA/CL</b>	0,78	35,461	0,61	1157,00	2415,00	0,03
<b>ROA</b>	0,65	28,000	0,42	0,07	0,53	0,01
<b>E/A</b>	0,82	36,600	0,68	0,11	1194,00	0,01
<b>ROE</b>	-0,02	0,016	0,00	0,99	95864,00	0,98

Source: Own elaboration with R program

As can be seen in Table 3, the variability of component or dimension 1 is explained by CA/CL (35.461%), ROA (28%) and E/A (36.6%). Component 2 is almost entirely explained by EBIT/PN, although the weight of this component is much lower than that of the main component 1.

Because of its major contribution to the explanation of variability, the principal component 1, which we have called FINANCIAL PERFORMANCE, has been considered as the latent variable representing economic and financial performance.

#### Analysis of size variables

The component or dimension that captures the latent variable SIZE has been obtained from the PCA analysis of the variables TURNOVER, STAFF COSTS and MARKET VALUE. The results are presented in the following two tables 4 and 5:

**Table 4: Eigenvalues**

	<b>Dim 1</b>	<b>Dim 2</b>	<b>Dim 3</b>
<b>Variance</b>	2,854	0,116	0,02
<b>Variance</b>	95,48%	3,85%	0,67%
<b>Cumulative Variance</b>	95,48%	99,3%	100%

Source: Own elaboration with R program

As can be seen in Table 4, dimension 1 explains 95.48% of the total variability in the variables relating to size, which suggests that practically all the relevant information is captured in the first component. The rest of the dimensions hardly contribute to the explanation of the variability of the variables.

**Table 5: Contribution of the variables to the components**

<b>Variable</b>	<b>Dim 1</b>	<b>Ctr</b>	<b>Cos2</b>	<b>Dim 2</b>	<b>Ctr</b>	<b>cos2</b>
BILLING	0,99	33,934	0,972	-0,13	15,452	0,018
0.018PERSONNEL_COSTS	0,96	32,176	0,922	0,28	67,815	0,078
MARKET_VALUE	0,99	33,891	0,971	-0,13	16,733	0,019

Source: Own elaboration with R program

As can be seen in Table 5 above, the three variables contribute in a balanced way (around 33%) to the definition of component one. Also, the high values of the squared cosines for each of these variables (0.972, 0.922, and 0.971) indicate a balanced representation of these variables in the first component. This shows that component one synthesizes well the variability of the three variables, which in turn reflects a latent variable. We have called this first component FINANCIAL PERFORMANCE.

Table 6 below shows some of the main statistics for the two dependent variables and the independent variable.

#### 4.2 OLS model

In order to verify the goodness of dimension reduction, a simplified version of the traditional regression models (OLS, Ordinary Least Squares) that abound in the literature with multiple independent variables has been carried out, using the two latent variables generated by PCA: SIZE and FINANCIAL PERFORMANCE.

Some of the descriptive statistics of the model are detailed in Table 6 below.

**Table 6: Descriptive statistics of the model variables**

	Dependent	Independent	
STAT.	POINTS	SIZE	PERFORMANCE FINANCIAL
R	1,00	0,8	-0,1
$\bar{x}$	52,94	0,0	0,0
s	17,29	1,7	1,3
x	94,00	5,8	4,9
Min	20,00	-1,3	-4,5

R: Correlation coefficient,  $\bar{x}$ : sample mean, s: standard deviation, Max:maximum, Min:minimum

Source: Own elaboration

The resulting linear regression model is as follows:

$$\text{POINTS} = 52,9 + 7,93 \times \text{SIZE} - 0,29 \times \text{FINANCIAL PERFORMANCE}$$

The regression results are detailed in Table 7 below:

**Table 7: Regression results**

	Data	coef	p-value	Significance
F	147,1		2,2e-16	Significant
$R^2$	0,61			
$\beta_0$		52,9	<2e-16	Significant
SIZE		7,9340	< 2e-16	Significant
FINANCIAL PERFORMANCE		-0,2943	0,63	Not significant

Source: Own elaboration

As can be seen in Table 7 the model has a good level of fit with a coefficient of determination  $R^2$  of 0.61. The variable SIZE with a  $p < 0.000$  is highly significant while the variable FINANCIAL PERFORMANCE with a p-value of 0.63 does not show statistical significance but, as we will see, it facilitates a classification of football clubs by their financial performance and sporting success that hides non-linear relationships between groups of teams. As might be expected the relationship between size and points is positive with a coefficient of 7.93. Financial performance shows a small negative relationship, with a coefficient of -0.29, which is not significant and contributes little to the explanation of points.

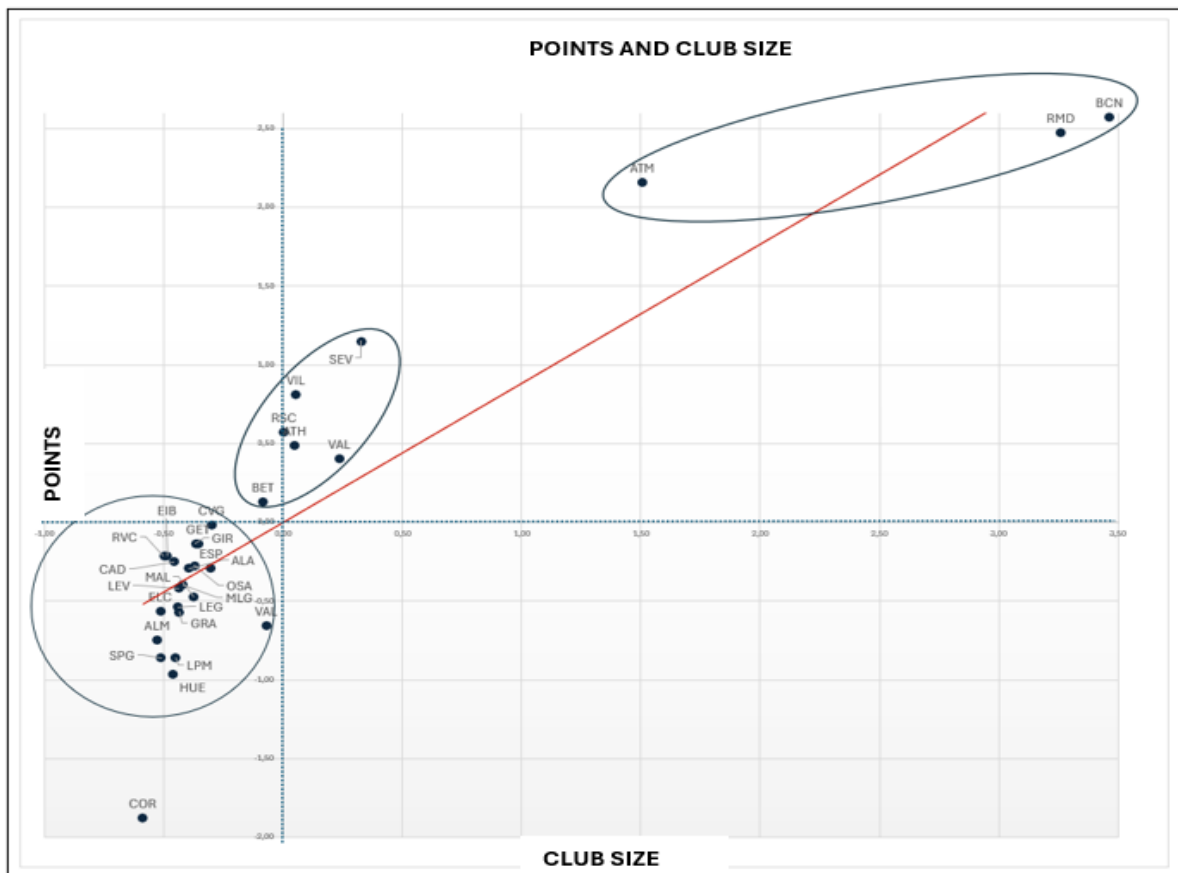
Finally, taking advantage of the reduction of dimensions achieved through the latent variables and the evidence of the non-linearity of the variable FINANCIAL PERFORMANCE, we have proceeded to design data visualizations with the aim of detecting non-linear team group structures. To do this, it has been necessary to calculate the average results of the variables for the set of seasons that the team has been in and to normalize the variables.

### 4.3 Visualization of model variables

A) Relationship between sporting success (points) and club size.

A visualization of the variables financial performance and points is presented below.

**Graph 1: Relationship between Sporting Success (Points) and Club Size**



Source: Own elaboration.

The trend line shows the linear relationship between Size and Points. Also, in order to plot the points, variable averages have had to be calculated for each team and set of seasons in which the team has been in the top division. The lines dividing the quadrants have been placed at the averages.

Underlying the linear regression model three groups of teams can be observed. The largest teams, Barcelona FC, Real Madrid and Atlético de Madrid (Group 1) are at a great distance from the rest of the teams. In fact, these three teams have shared the top three positions in La Liga in the ten seasons analysed and have therefore also participated in all ten editions of the UEFA Champions League (see Table 7). Leaving aside the debt factor, for the period analyzed these three teams show a clear dominance of the competition.

On the other hand, medium-sized teams with average sporting success can be seen at points such as Sevilla FC, Valencia, Villarreal, Athletic Bilbao and Real Sociedad (Group 2).

**Table 7: Sporting success in points and participations in European championships.**

	Champions	UEFA	Total	Average number of points
<b>ATM</b>	10		10	79
<b>BCN</b>	10		10	85
<b>RMD</b>	10		10	83
<b>SEV</b>	5	5	10	63
<b>VIL</b>		7	7	62
<b>RSO</b>	1		1	71
<b>ATH</b>		4	4	65
<b>BET</b>		4	4	61
<b>CTV</b>		1	1	60
<b>ESP</b>		1	1	53
<b>GET</b>		1	1	59
<b>GRN</b>		1	1	60
<b>OSA</b>		1	1	53
<b>RSO</b>		2	2	66

Source: Own elaboration

Among the members of Group 2, only Sevilla has competed five times in the Champions League in the period. Meanwhile, Valencia FC, at the other end of this group, with an average of 54 points, has not participated in any European competition despite being the fifth team in terms of market value with an average of approximately 300 million Euros. Finally, there are the small and poorly performing teams. Table 8 below shows the number of seasons and average points of a sample of these bottom teams.

**Table 8: Group 3- Position and average points**

Team	Abrv.	Sample seasons	Points average
<b>Cordoba</b>	COR	1	20
<b>Almeria</b>	ALM	3	37
<b>Elche</b>	ELC	4	40
<b>Sporting de Gijón</b>	SPG	2	35
<b>Huesca</b>	HUE	2	33
<b>Cadiz</b>	CAD	3	42
<b>Las Palmas</b>	LPM	3	35
<b>Sample</b>			<b>42</b>

Source: Own elaboration

As can be seen in Table 8, the teams in the last group are characterized by below average results and, more importantly, the number of seasons. Among the rest of the teams we find the so-called "yo-yo" teams (Barajas & Others, 2015) that move between the first and second division.

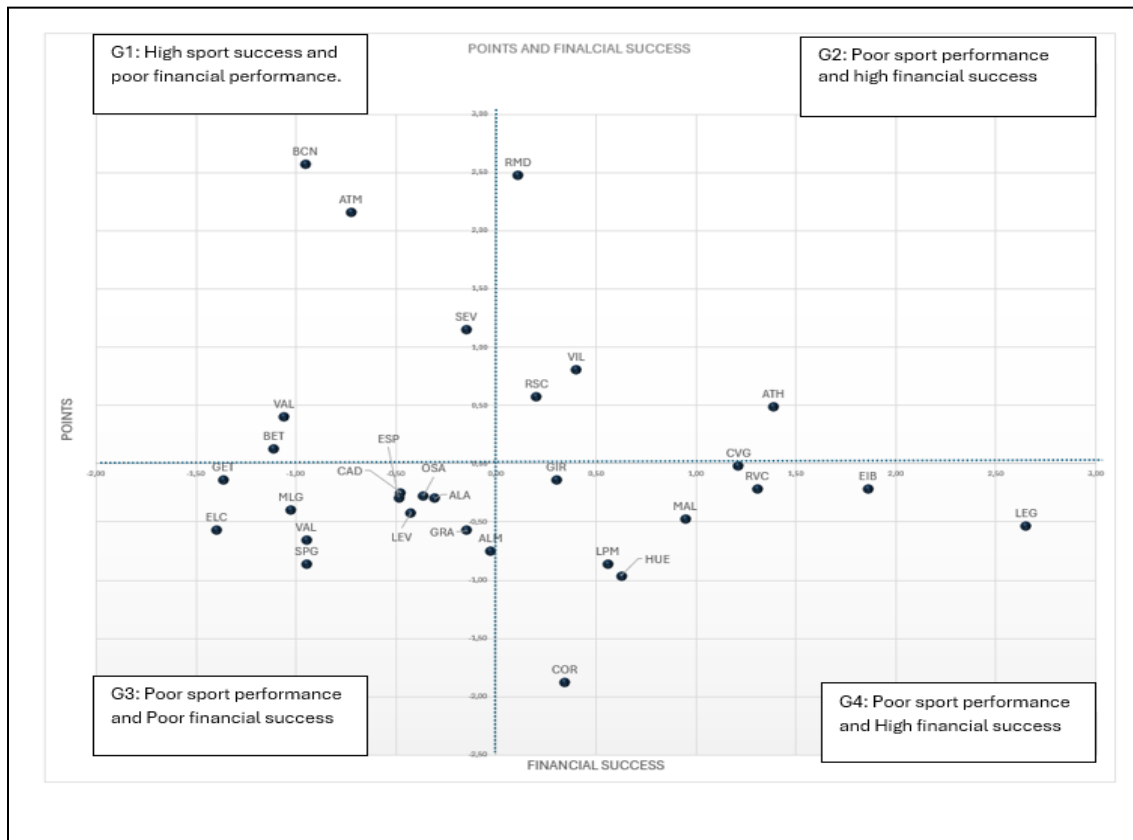
### **A) Relationship between Sporting Success (Points) and Financial Performance**

In the previous section it has been seen that the Financial Performance component, even unifying the main variables of the Z of Amat & Others, 2017 in a single latent variable that included the main factor to explain the variability, was not statistically significant in the

explanation of sporting success (points), providing very little explanation to that provided by the variable SIZE. However, it should be noted that the study has not specifically considered financial impairment and erosion in points in long time series where today's over-indebtedness may have an impact on the performance of future seasons and not the current one. On the other hand, as can be seen in graph 2 below, Financial Performance is relevant when discriminating between groups of teams.

A visualization of the variables financial performance and points is presented below.

**Figure 2: Relationship between Sporting Success (Points) and Financial Performance**



Source: Own elaboration.

The teams have been divided into four quadrants according to their averages with respect to the mean (normalized variables) at the crossover point between the POINTS variable and the FINANCIAL PERFORMANCE variable.

The high correlation between points and size also makes it possible an interpretation in terms of club size.

As can be seen in Graph 2, after segmenting the teams according to their relative position with respect to the median, we obtain four groups of teams (G1, G2, G3 and G4) with homogeneous characteristics in terms of sporting success, size and financial performance. On the one hand, we have teams in G1 such as FC Barcelona with great sporting success, both in terms of points in the league and in terms of participations and prizes in European competitions and, at the same time, a complicated financial situation that has forced it to divest strategic assets and has meant, in application of the League's financial *fair play*, severe restrictions on the hiring of new players.

The G2 quadrant represents successful teams in the sporting and financial domains. In this group we have teams such as Real Madrid, Sevilla, Girona or Villarreal.

The G3 quadrant captures what we have termed "me me me" teams, with below average points, poor financial performance and recurrent entries and exits from the top division.

Finally, the G4 includes healthy teams, with good financial management but reduced sporting performance. Eibar and Leganés are clear examples of this group.

## 5. CONCLUSIONS

It is common to find in the literature that a significant number of variables are used to explain the sporting success of teams, such as turnover (or its logarithm), personnel costs, total assets or market value, among others. The explanatory power of turnover (its logarithm, in many cases) has a very high correlation coefficient with the points, explaining up to 80% of its variability. The rest of the variables also have a high level of correlation, both with points and turnover, reflecting a high co linearity and over-explanation of the variable. In our opinion, all these variables refer to an underlying construct of an economic nature, which is club size. By means of PCA we have taken the variables turnover, staff costs and market value and reduced the dimensionality to a single latent variable which we have denoted SIZE.

On the other hand, it has been found that the financial variables hardly correlate with financial success measured in points and, as in the previous case, in many cases they are redundant or linear transformations of each other. Thus, first, the initial financial variables selected were those established in the Z model of Amat & Others (2017). Subsequently, these variables (Current assets/ Current liabilities), (Equity / Assets), ROA and ROE were reduced to a single latent variable through PCA that we have called FINANCIAL PERFORMANCE, which explains a significant proportion of the variability of all the variables.

Taking these two variables as dependent variables, a linear regression was modeled with high significance and consistency, with no problems of autocorrelation or abnormality of the residuals. As expected, the variable SIZE is highly significant, while FINANCIAL PERFORMANCE adds little explanatory power.

On the other hand, the reduction of variables to two allows the design of data visualizations that provide relevant information about underlying club groupings that would otherwise be hidden.

The visualization of the clubs in the quadrants determined by the averages of the axes POINTS (ordinates) and SIZE (abscissas) reflects three clusters of teams: the *top* teams (BCN, MDR and ATH) which share between them the top three positions in all ten seasons and are far distanced both in size and points from the rest. A second line of big groups (but far from the three above) that occasionally enter the Champions League (SEV) and often reach European league positions. Finally, the group of small teams, with similar points averages, with high rivalry between them and which, in many cases, move up and down from the second to the first division (yo-yo teams).

On the other hand, FINANCIAL PERFORMANCE, which provided little explanation in the linear models, offers, thanks to the reduction to a single latent variable, the possibility of discriminating groups of teams by means of visualization techniques. From the crossing of the POINTS variable and the FINANCIAL PERFORMANCE variable, it has been possible to discriminate between groups of teams.



In this case, four groups have been identified, the first and second groups are the strongest teams in the competition in terms of points, but unlike the clusters by size in Graph 1 above, it is now possible to discriminate between top teams (in the top positions in the league and participation in European championships) that are well managed financially (in relative terms) and those with a weaker financial situation. Thus, it is now possible to differentiate, for example, between FC Barcelona and Real Madrid. Both are strong teams that have been fighting for the last ten leagues for the top positions, but Real Madrid's finances are healthier than those of FC Barcelona. The other two groups, three and four, include clubs with little sporting success (points below the median) but enrich the previous model based only on size by differentiating again between clubs with a better or worse financial situation.

Group three includes the clubs that we have called "yo-yo" or "lift" clubs, such as Elche, Valladolid, Huesca and Alavés. These are teams that are not very competitive and that also have weak financial situations in many cases, with low budgets and limitations of LaLiga that make it difficult for them to maintain the competitiveness of the squad. The last group, group four, is generally made up of modest and well-managed teams (such as Eibar) but with squads that are not always competitive as their own strategy limits high levels of indebtedness.

Finally, the FINANCIAL PERFORMANCE variable, like Z score, can be used by clubs to test their level of financial health and their position with respect to the sector average. An indicator such as this, which is undoubtedly simplified, does not cover all the explanatory power, but as a counterpart, it offers simplicity compared to a ratio-by-ratio comparison. Future research can build on this work in predictive models of clubs' financial performance.

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## ANNEXES

### Annex 1: Details of some of the studies analysed

Study	Country	Target	Method	Key results
Yiapanas <i>et al.</i> (2023)	Cyprus	Identify the key stakeholders of today's football and their distinctive value contribution.	Multi-level approach.  Design of the preliminary conceptual framework and 41 semi-structured interviews.	The football industry has some distinctive structural factors that differentiate it from the rest and are embodied in a distinctive value contribution that football clubs bring to their different stakeholders.
Toma & Campobasso (2023)	European Football (UEFA) Five major leagues (10 years)	Main factors of sporting success from a strategic perspective.	Data visualization, Gini index and logistic/ordinal regression	
Prayoga <i>et al.</i> (2022)	European football in demand	Explanation of listed equipment prices	Multiple regression  It combines financial ratios and a sports performance indicator as independent variables. The dependent variable is the share value.	Sporting performance has a significant impact on the clubs' share price. Liquidity ratio shows positive correlation with share price.
Ahtiainen & Jarva (2022)	European football (UEFA) Five major leagues.	Impact of Financial <i>Fair Play</i> (FFP) regulations on UEFA football.	Generalized Estimated Equations (GEE), logistic regression and OLS models.	The implications of FFP can only be seen, with some significance, in Spanish football, being negligible in the rest of the major leagues.
Alaminos <i>et al.</i> (2020)	234 1st and 2nd division teams of the European national leagues	Analysis of the financial performance of European clubs using neural network technology.	<i>Multilayer Perceptron</i> (MLP)	The financial performance of a club depends primarily on liquidity, indebtedness and sporting performance.
Xiao (2021)	Spanish League	Correlation Financial and sporting performance	Factor analysis and correlation analysis	Sporting and financial performance are not linearly correlated. Financial success does not guarantee sporting success.

Lepschy (2018)	N/A	Literature review	N/A	Three types of studies: comparative, predictive and local advantage.
Galarotis <i>et al.</i> (2017)	France (Ligue 1).	Correlation analysis between financial, business and sporting performance	Double step: multi-criteria (Promethee II) and partial Least Squares	Positive correlation between the endogenous variable of business performance and sports performance and, at the same time, from sports performance to business performance. Negative correlation of financial and sporting performance.
Silva (2015)	Sample of European clubs.	Impact of corporate governance on the financial and sporting performance of European football.	Multiple regression	The type of ownership has an impact on the financial results of the analyzed clubs.
<b>Study</b>	<b>Country</b>	<b>Target</b>	<b>Method</b>	<b>Key results</b>
Cintia <i>et al.</i> (2015)	Four major European championships.	Correlation between passing data in a football match (synthesized in the H-indicator) and the sporting success of a team.	Correlation analysis Simulations	Correlation between the H indicator, which collects several averages and variances related to passing, and sporting success in terms of goals and goal attempts.
Barajas <i>et al.</i> (2005)	Spain (first and second division).	Causes of the poor financial situation of football clubs in the two Spanish big leagues.	Multiple regression	Structural deficiency of Spanish football. Correlation between sports staff costs and turnover. The model is not conclusive as to why some of the clubs end up in competition and others do not.

Source: Own elaboration

## Annex 2: Descriptive statistics of the main baseline variables.

VARIABLE	TYPE	R	DST	PRM	CP
POINTS E. SPORT	DEP	17,2	52,9	0,33	94,0
MARKET_VALUE	TAM	0,79	255,3	267,5	0,95
PORTER_VALUE	TAM	0,67	19,55	13,70	1,43
GOALKEEPER_VALUE_PROP	TAM	0,00	0,03	0,05	0,66
DEFENCE_VALUE	TAM	0,75	65,68	79,81	0,82
VALUE_DEFENCES_PROP	TAM	0,12	0,07	0,30	0,24
MIDFIELD_VALUE	TAM	0,76	86,83	80,83	1,07
MIDFIELDERS_VALUE_PROP	TAM	0,14	0,09	0,31	0,29
FRONT_VALUE	TAM	0,75	101,1	93,24	1,08
FORWARD_VALUE_PROP	TAM	0,04	0,08	0,34	0,25
INVOICING (*)	TAM	0,75	189,7	95,39	1,99
PERSONNEL_EXPENDITURE (*)	TAM	0,75	123,1	72,03	1,71
BILLING	TAM	0,12	0,16	0,75	0,21
CAPEX/ASSETS	FIN	0,07	0,17	0,14	1,25
FCF/A	FIN	0,07	0,18	-0,01	-13,3
CA/CL	FIN	0,14	0,68	0,53	1,29
E/ASSETS	FIN	0,02	0,32	0,08	3,81
INTANGIBLE/ASSET	FIN	0,05	0,18	0,36	0,51
ROA_EBIT/ASSETS	FIN	0,20	0,16	0,04	4,31
EBITDA/REVENUE	FIN	0,08	0,21	0,25	0,82
NET_PROFIT/ REVENUE	FIN	0,10	0,20	-0,03	-5,80

(\*) in EUR million.

R: Correlation coefficient with respect to Points, STD: standard deviation, PRM: average, PC: Pearson correlation coefficient.