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## ORIGINAL

### MEASURING HOME ADVANTAGE IN SPANISH FOOTBALL (1928-2011)

### VENTAJA DE JUGAR EN CASA EN EL FÚTBOL ESPAÑOL (1928-2011)

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#### ABSTRACT

Pollard (1986) established the procedure for analyzing the home advantage (HA). The HA has been studied in many different sports, both individual and team sports, determining its existence and its possible causes. This article analyzes the HA of the first division of Spanish football across the history (from 1928 until 2011). The sample is of 80 seasons and 22015 games of the highest level in Spain. The HA (mean±sd) is of 70.8±0.14 in the highest category in Spanish football during the period when a victory was worth two points (1928-1995) and 56.7±0.14 when three points were awarded for a victory (1995-2011).

**KEY WORDS:** Home Advantage, sport, football, performance analysis.

## RESUMEN

Pollard (1986) estableció el procedimiento para analizar la ventaja de jugar en casa, efecto que en términos anglosajones se denomina “*home advantage*” (HA). La HA ha sido estudiada en multitud de deportes, tanto individuales como de equipo, determinando su existencia y sus posibles causas. Este artículo analiza la HA de la primera división de fútbol español a lo largo de su historia (desde 1928 hasta el 2011). La muestra es de 80 temporadas y 22.015 partidos jugados en las competiciones de liga de máxima categoría española. La HA es de  $70,8 \pm 0,14$  en las máximas categorías del fútbol español en la época en la que el valor de la victoria era de dos puntos (1928-1995) y de  $56,7 \pm 0,14$  cuando se otorgan tres puntos por la victoria (1995-2011).

**PALABRAS CLAVE:** Ventaja de jugar en casa, deporte, fútbol, análisis rendimiento.

## INTRODUCTION

It is thought that the advantage of playing at home has existed for many years, especially in team sports. Koppet (1972) supported this scientifically. The analysis of the home advantage started with the studies by Schwartz and Barsky (1977) in American sports, such as university basketball (64%), ice hockey (64%), American football (60%) and baseball (53%). This study was followed by Nevill and Holder (1999) who determined that the advantage is real.

Diverse studies have searched the factors that influence the HA. Courneya, and Carron (1992) exposed the following factors: the rules of the game, the fans, the journeys made, the referees attitude and the familiarity of the place of play.

Other factors analysed in the HA are the influence of the public, taking into account the number of spectators, the density of the fans, the proximity of the playing ground or the intensity of support (Pollard, 2006a; Pollard, and Pollard, 2005; Wolfson, Wakelin and Lewis, 2005 ), the possible alterations provoked by the journey made by the players (Brown, Van Raalte, Brewer, Winter, Cornelius, and Andersen, 2002; Clarke, and Norman, 1995; Pollard, 2006a), more knowledge of the home ground, such as special characteristics or abnormal dimensions (Barnett, and Hilditch, 1993; Clarke, and Norman, 1995; Pollard, 1986), characteristic climatic conditions (Pollard, da Silva, and Nísio, 2008; Seckin, and Pollard, 2007) or the behaviour of the referees, analysing the frequency of use of discipline sanctions (Glamser, 1990; Nevill, Newell, and Gale, 1996).

The study of the HA has found physiologic alterations (Neave, and Wolfson, 2003), proving an increase in hormonal activity in home teams. The use of game tactics has also been studied, determining whether there are variations in

the performance of the teams (Carmichael, and Thomas, 2005; Seckin, and Pollard, 2007; Tucker, Mellalieu, James, and Taylor, 2005).

Studies of the HA have been done in three types of sports. The first lot are the sports in which the point system is highly influenced by the subjectivity of the judges, such as rhythmic gymnastics or boxing (Balmer, Nevill, and Lane, 2005). Another group of sports are the ones that are valued in an objective way, such as time or distance. Examples in this category are studies in athletics (Bray, and Martin, 2003, Bray, and Widmeyer, 2000; Jamieson, 2010), skeleton (Bullock, Hopkins, Martin, and Marino, 2009) speed skating (Koning, 2005). The third group is formed by sports that are judged partly in a subjective way by the judges. This is the case of team sports (including football), where the referees apply the rules with certain possibilities of interpretation. The studies that analyse the HA in team sports are various, such as baseball (Adams, and Kupper, 1994; Bray, Obara, and Kwan, 2005; Dosseville, 2007; Levernier, and Barrilla, 2007), ice hockey (Agnew, and Carron, 1994; Liardi, and Carron, 2011), basketball (Greer, 1983; Jones, 2007; Moore, and Brylinsky, 1993; Varca, 1980), volleyball (Marcelino, Mesquita, Palao, and Sampaio, 2009), rugby (Morton, 2006; Thomas, Reeves, and Bellhome, 2008) or handball (Gutiérrez, Saavedra, and Fernández, 2012).

Football has the most studies and most of them are from the English football leagues (Boyko, Boyko, and Boyko, 2007; Carmichael, and Thomas, 2005; Dawson, Dobson, Goddard, and Wilson, 2007; Jacklin, 2005; Johnston, 2008; Nevill, *and cols.*, 1996; Pollard, 1986; Thomas, Reeves, and Davies, 2004; Thomas, Reeves, and Smith, 2006; Wolfson, *and cols.*, 2005). Also other studies have been made in Brazil (Pollard, *and cols.*, 2008), Scotland (Nevill, *and cols.*, 1996), France (Dosseville, 2007), Norway (Tenga, Holme, Ronglan, and Bahr, 2010), Portugal (Cardoso-Marques, 2009) and Turkey (Seckin, and Pollard, 2007).

Other studies are more ample such, as world football (Pollard, 2006b) and South and East European football (Pollard, y Gómez, 2009). Also there are investigations in international competitions such as European cup (Page, and Page, 2007), or the UEFA Champions League (Papahristodoilou, 2008).

The role of the referee in the HA has also been studied (Boyko, *and cols.*, 2007; Dawson, *and cols.*, 2007; Johnston, 2008; Nevill, Balmer, and Williams, 2002; Poulton, Siu, and Masters, 2011).

Also the role of the fans in the HA has been studied (Downward, and Jones 2007; Johnston, 2008; Nevill, *and cols.*, 2002).

Other studies on the HA include the effects of the type of ball used in French professional football (Dosseville, 2007), the effect of a change of stadium on the HA (Pollard, 2002), the aggressive behaviour of players depending on home and away games (Thomas, *y cols.*, 2006), the effect of the nationality of the players in international football and its relation on the HA (Poulter, 2009), the

variations of HA in function of the game tactics (Tenga, *and cols.*, 2010) or the perception of the English fans in football (Wolfson, *y cols.*, 2005).

The longitudinal studies on the HA (such as this present study) are less frequent. One was made in the first English division of football between 1888 and 1984 (Pollard, 1986). Also in the two first English divisions a study was made analysing the changes in the HA from the Second World War (Jackilin, 2005). Finally a study by Cardoso-Marques (2009) on the HA studied the competitive balance in Portuguese football between 1960 and 2007.

The objectives of the present study are the following: find out the HA in the highest Spanish football category between 1928 and 2011 and its evolution during this time. Relate the HA with the points and the classification. Compare goals scored and received as a home and away team. Finally, analyse the HA of the champion teams of the league.

## **METHOD**

### ***Sample and variables***

The sample of the study consists of 22,015 games of male football played during 80 seasons of the highest category of Spanish football, played between 1928 and 2011.

Historically different formats of leagues exist. From the start (1928-29) until the 1994-95 season the point system awarded two points for a victory. From 1995-96 to 2010-11 a victory is worth three points. When considering the number of participating teams there have been a few variations. The competition started off with 10 teams : six champions (Athletic Club, Arenas Club de Guetxo, Real Madrid, Real Sociedad, FC Barcelona and Real Unión de Irún) and three sub champions (Español de Barcelona, Atlético aviación and Europa) which was up till then the Spanish Championship or the Copa del Rey; the tenth team (Racing de Santander) left the first classification tournament in the history of the Liga. In the 1934-35 season the number of teams were 12. In 1941- 42 this was raised to 14 and in 1950-51 raised again to 16. In the 1971-72 season, the number of teams was raised to 18 and raised again to 20 in the 1987-88 season. In the 1995-96 and 1996-97 seasons 22 teams participated in the league. From 1997-98 until 2010-11 the number of competing teams is 20. In the 1986-87 season a play off was played in groups of 6 teams that played home and away games of 10 games).

The registered variables were the final results of the games played as a home and away team, the points obtained in the league, the goals scored and received and the final classification in the league.

The information used was obtained from the Liga de Fútbol Profesional (<http://www.lfp.es>), and the independent website Cero a cero

(<http://www.ceroacero.es>). The information was compared in an independent form from both sites to minimize the possible number of errors.

### Calculation of the advantage of playing at home

The Spanish football league is based on a round robin system, in which each team plays the same number of games both home and away. To be able to calculate the HA of the league a coefficient calculation is used of the points won at home between the total of points obtained both home and away (Pollard, 1986), establishing the existence of the HA when more than 50 % of the points obtained were won as a home team. When analysing the HA independently for each team, the HA was established taking into account the performance of the home team with the percentage of points won at home compared with the away performance. This analysis can be made with the percentage of points won at home in relation with the total of points won at home and away, taking draws as half victories.

The level of significance of the HA is calculated with the variable of points obtained, supposing that the null hypothesis that no advantage is obtained playing at home is true (Pollard, 1985, 1986), meaning that one of every two games at home are won (50%). The contrast was done using the rank test with Wilcoxon sign. The bivariate correlations of Pearson and Spearman are used to establish the level of association between the number of points obtained and the classification of a team with the advantage of playing at home. The Mann-Whitney test was used to compare the goals scored and received as a home and away team.

## RESULTS

The analysis of the sample used reveals that the HA is of  $70.8 \pm 0.14$  in the highest Spanish football categories when the value of a victory was worth two points (from 1928 to 1995) and a HA of  $56.7 \pm 0.14$  when three points were awarded for a victory (from 1995 to 2011), these values are significant in both cases ( $p < 0.001$ ). The values are shown in table 1.

**Table 1.** Advantage of playing at home in the highest Spanish football category

Season	Points for victory	Leagues	Record at home				HA			
			Played	Won	Drawn	Lost	%	S.E.	Significance <sup>1</sup>	Size of effect
1928-1995	2	64	15771	9367	3603	2801	70.8	0.14	<0.001	0.82
1995-2011	3	16	6244	3002	1615	1627	56.7	0.14	<0.001	0.44
Season	Teams	Leagues	Played	Won	Drawn	Lost	%	S.E.	Significance <sup>1</sup>	Effect Size
1928-34	10	6	540	353	84	103	73,1	0,14	<0.001	0.84
1934-41	12	4	528	347	69	112	72,3	0,15	<0.001	0.82

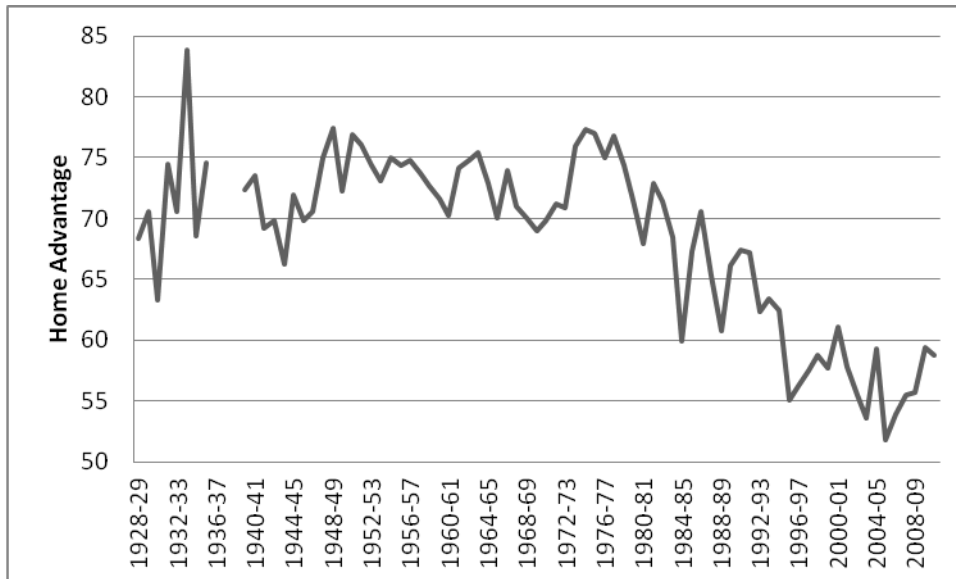
1941-50	14	9	1638	1007	324	307	71,4	0,14	<0.001	0.82
1950-71	16	21	5040	3192	990	858	73,2	0,14	<0.001	0.84
1971-87	18	16	4985	2941	1275	769	71,8	0,12	<0.001	0.83
1987-95	20	8	3040	1527	861	652	64,4	0,13	<0.001	0.76
1995-97	22*	2	924	431	249	244	55,6	0,13	<0.018	0.36
1997-11	20*	14	5320	2571	1366	1383	56,9	0,14	<0.001	0.45

<sup>1</sup> Significance of the Wilcoxon range sign test.

\*Victory is worth 3 points.

### Evolution of the advantage of playing at home in the highest category of Spanish football

A descending tendency can be observed in the HA between 1928 and 2011 in the highest category of Spanish football. The magnitude of the drop is higher than thirty percentage points. The highest value is of 83.9% in the 1933-34 season and the minimum is of 51.8% in the 2005-06 season.



**Figure 1.** Annual evolution of the HA in the highest category of Spanish football.

In the evolution of the HA by periods higher values of the home advantage are observed from the start of the league until 1987 with values slightly higher than 70%. After the foundation of the Liga de Fútbol Profesional in 1984, the restoration of 20 teams in the league and the implantation of a system that awards three points for a victory, the values of the advantage of playing at home dropped around 15 percentage points (Figure 2).



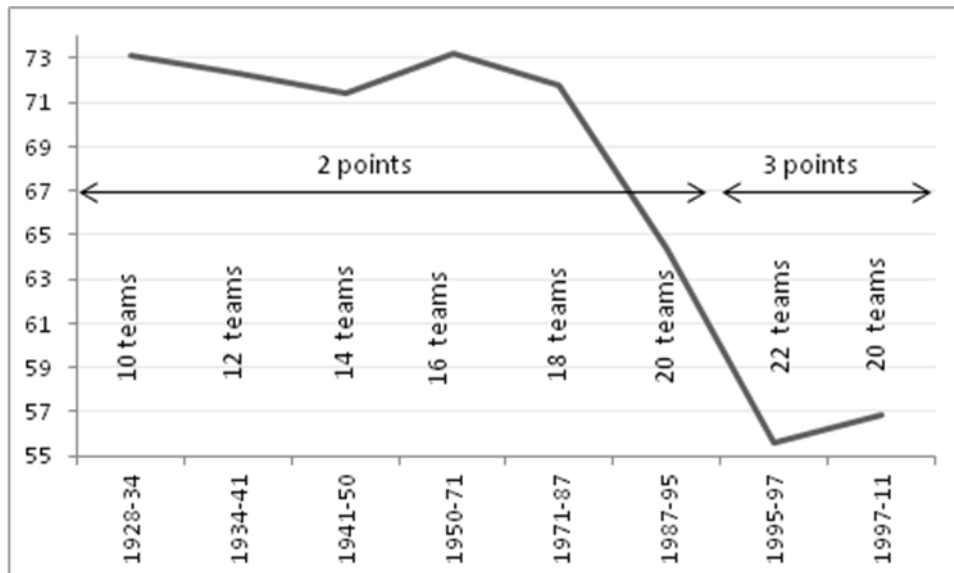


Figure 2. Evolution by periods in the HA in the highest category of Spanish football.

### Advantage of playing at home, points and classification

Both the classification of a team and the number of points won prove a significant association with the HA. The classification of a team in the league has an inverse association with the HA (-0.767 in the classification system of two points for a victory and -0.834 in the three point system). The points obtained by a team are positively associated with the HA (0.556 with the two point system for every game won and 0.860 with the three point system). The values can be seen in Table 2.

Table 2. Association between HA, the points and the classification obtained in a league for each point system.

Points for victory		Points <sup>1</sup>	Classification <sup>2</sup>
2	Correlation	0.566	-0.767
	95% CI	0.523;0.606	-0.791;-0.741
	Significance	<0.001	<0.001
	Number of teams	1018	1018
3	Correlation	0.860	-0.834
	95% CI	0.829;0.885	-0.864;-0.798
	Significance	<0.001	<0.001
	Number of teams	324	324

<sup>1</sup> Bivariate correlations of Pearson

<sup>2</sup> Bivariate correlations of Spearman.

### Goals scored and received as a home and away team

Significant differences were found ( $p < 0.001$ ) between the goals scored as a home team and away team (the teams that play at home score almost double the amount of goals than away). Same happened between the number of goals received as a home and away team (the teams received almost double the amount of goals as an away team than a home team).

**Table 3.** Comparison of goals scored and received as a home and away team

Descriptives			Mann-Whitney			
<b>Goals scored as</b>	<b>Average</b>	<b><math>\sigma</math></b>	<b>Rank</b>	<b>Average rank</b>	<b>Sig.</b>	<b>Size of effect</b>
<b>Home</b>	30-31	9.9	<b>Positives</b>	685.76	0.000*	0.85
<b>Away</b>	16-17	6.0	<b>Negatives</b>	121.07		
<b>Goals received as</b>	<b>Average</b>	<b><math>\sigma</math></b>	<b>Ranks</b>	<b>Average rank</b>	<b>Sig.</b>	<b>Size of effect</b>
<b>Home</b>	16-17	6.0	<b>Positives</b>	128.34	0.000*	0.85
<b>Away</b>	30-31	9.9	<b>Negatives</b>	692.65		

\*Statistic significance

### **Advantage of playing at home of the champion teams of the league**

The advantage of playing at home of the champion teams of the league can be observed in table 4. The highest value is obtained by Real Sociedad (69.9%), which means that they obtained good results globally thanks to the games played at home. The lowest value was obtained by Real Madrid (61.1%).

**Table 4.** Advantage of playing at home of the champion teams of the league

	Leagues won	Global			Home			Advantage of playing at home (%)
		Played	Won	Drawn	Played	Won	Drawn	
R. Madrid	31	2534	1475	521	1267	968	184	61.1
Barcelona	21	2534	1407	529	1267	951	196	62.8
At. Madrid	9	2386	1101	552	1193	764	242	64.3
Athletic	8	2534	1113	577	1267	808	245	66.4
Valencia	6	2436	1092	559	1218	784	257	66.5
R. Sociedad	2	2074	775	514	1037	593	257	69.9
Deportivo	1	1378	532	337	689	375	178	66.2
R. Betis	1	1538	550	396	769	399	201	66.8

## **DISCUSSION**

The objective of this present study was to analyse the behaviour of the HA in an exhaustive sample in the highest category of Spanish football from the start till 2011. According to the information obtained, the HA in the highest category of Spanish football is of  $70.8 \pm 0.14$  when a victory was worth two points (from 1928 to 1995) and of  $56.7 \pm 0.14$  when a victory is worth three points (from 1995 to 2011), these values are significant in both cases ( $p < 0.001$ ).

Pollard (1986) showed values that oscillate between 53.6% for baseball and 65.5% for soccer, 63.3% for basketball and 63.9% for European football. Afterwards, Pollard (2006b) proved that regional variations exist at a world level in the HA values, explained by factors such as the area of the country, meaning long journeys or territoriality, explained by Neave, and Wolfson (2003). Schwartz, and Barsky (1977), who established the HA in the National Hockey League of 66% (NHL) and of 67% in the National Basketball League (NBA). It is necessary to point out that these studies were done quite a few years ago and that sport has evolved.

More recent studies by Pollard and Pollard (2005) established for football and basketball values of 60% and for ice hockey 55%, similar values for the HA obtained in this present study when a victory is worth three points.



The evolution of the HA during the history of the league descended ten percentage points between 1928 and 1995 (period in which a victory was worth two points) and the values are similar and around the value of 55% when a victory is worth three points. This fall seems to indicate that professionals have progressively overcome the HA, diminishing the preconception of playing away.

The evolution of the level of HA agrees with the conclusions obtained by Pollard (1986), as the seasons advance, the HA decreases. In the Pollard study, the HA went from 67.9% in the first period to 63.9% almost 100 years after, although in the present study the fall is more marked (more than 9 points between 1928 and 1995) in Spanish football than in English football, although Pollard's study includes a whole century of competition, whereas the actual study is of 80 years, meaning that there is more of a drop in less time.

If we look at teams that have managed to win at least once the league we can see there are two groups of teams. The first group formed by Real Madrid and Barcelona, who are used to winning and don't base their victories on winning home games, as they are able to win away games, which reduces the value of the advantage of playing at home. The second group is formed up of teams that have won the league few times (between one and nine times) who base their results on winning at home, meaning that their HA values are higher than the teams that form the first group.

Between the lines of the analysis the influence of the level of the team in the HA proves to show a significant and positive association between the points won by a team and the HA. The classification of a team in the league has an inverse association with the HA. These results contradict the ones of Morton (2006) in rugby and of Jacklin (2005) in football, because both concluded that no differences were found in the HA in function of the quality of the participating teams. Also differences were found in the results of the present study with the ones of Bray (1999) in ice hockey, as this author proved that the HA had a similar percentage of victories as a home team than an away team, independent on the level of quality of the teams. It's necessary to comment that in ice hockey the possibility of a game ending in a draw is much less than in football. In the games analysed by Bray (1999) during a period of 20 years, only 13.6% of games ended in a draw, whilst in the present study the amount of games analysed was of 23.7%.

However, there other studies whose conclusions are similar to ones of this study. The analysis of the category variable of the competition agrees with the conclusions of Pollard (1986), proving in both studies that as the category is lower the HA is higher.

## CONCLUSIONS

The advantage of playing at home exists and is significant, both when a victory was worth two points and when it is worth three points. Their values are of  $70.8 \pm 0.14$  and  $56.7 \pm 0.14$  respectively.

The evolution of the HA from 1928 until now is decreasing, from values higher than 70% at the start of the competition to values at around 55% currently.

The values of the HA are lower with the professionalization of Spanish football and with the change of the point system, changing from two to three points for a victory.

The teams with the best classification and with the most number of points have better HA values.

Between the teams that have won the competition at least once, there are two groups: the first group formed by Real Madrid and Barcelona who base their results globally both at home and away; the second group is formed by teams that have won the league between one and nine times, who base their results more on winning their home games.

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