Economics Bulletin

Volume 40, Issue 2

Head coach change and team performance in the French men's football Ligue 1, 2000-2016

Nicolas Scelles
Manchester Metropolitan University

Matthieu Llorca
Université of Bourgogne Franche-comté

Abstract

The purpose of this study is to analyse the impact of a head coach change on team performance in men's football. Its originalities are twofold: its focus on the French Ligue 1 over the 2000-2016 period; and the fact to consider the aforementioned impact in relation to expected performance as measured by betting companies. The method is based on regressions with fixed effects for team-season. The numbers of observations is 3,600 games (94 team-seasons). Team performance is alternatively measured by the number of points, whether the game was won or not, and the goal difference. The independent variables are home advantage, the positions of both teams prior to the game, the position of the opponent at the end of the previous season, a head coach change for team i and a control group, i.e. no coach change for the same team in another season despite a quite similar performance. Results show that both a head coach change for team i and its control group have a significant positive impact. They do not enable to conclude to a better impact of one of these two variables over the other. When controlling for expected performance before and after a head coach change and its control group, the dummy associated to the control group has no significant impact anymore. Since the paper provides some evidence that a head coach change may have a positive impact on team performance, it supports the idea of considering this option when looking for some ways to improve performance.

The authors thank the editor and the two anonymous reviewers for their helpful comments, as well as the participants of the DESport (Economic Dynamics of Sport) Seminar and the ESEA (European Sport Economics Association) Conference who provided feedback on communications related to this paper and an earlier version. Errors are their own.
Citation: Nicolas Scelles and Matthieu Llorca, (2020) "Head coach change and team performance in the French men's football Ligue 1, 2000-2016", *Economics Bulletin*, Volume 40, Issue 2, pages 920-937
Contact: Nicolas Scelles - N.Scelles@mmu.ac.uk, Matthieu Llorca - Matthieu.Llorca@u-bourgogne.fr.
Submitted: January 14, 2020. **Published:** April 15, 2020.

1. Introduction

Dating back at least 2,000 years, the "Great Person Theory of Leadership" is one of the cornerstones of traditional academic and lay understandings of leadership (Haslam, 2010). Kuper and Szymanski (2012) note that academic historians binned this theory decades ago. However, Anderson and Sally (2014) state that the "Great Person Theory" has recently been pulled out the bin by business-school professors and economists (see e.g. Graziano and Luporini, 2017). As underlined by Van Ours and Van Tuijl (2016, p. 591), "If managers are important and a firm performs poorly, replacing a manager should lead to better performance. Indeed, ending the contract of a manager prior to expiration is a crucial element of business decision-making."

The present research is interested in the impact of a manager change on firm performance. More specifically, it focuses on the impact of a head coach change on team performance (on the pitch) in French men's football. This topic is relevant to sports economics and management. Indeed, these disciplines are interested in the maximisation of club objectives since their seminal articles. In the North American context, Rottenberg (1956) and Neale (1964) assumed that clubs are profit maximisers. However, in the European context, Sloane (1969, 1971) argued that clubs are utility (win) maximisers, aiming for maximising their success on the pitch. Although this distinction profit vs. win maximisation has been qualified (see e.g. Terrien, Scelles, Morrow, Maltese & Durand, 2017), the maximisation of team performance (on the pitch) remains a key topic in sports economics and management. Since a head coach may affect such performance, it is worth investigating the impact of a head coach change on team performance.

Besides, the case of the French Ligue 1 is interesting. Indeed, it was the only Big 5[1] league not tackled in the literature in English on the determinants and / or impact on team performance of head coach change until 2017. In their working paper looking at the determinants of head coach quits and dismissals in professional football, Bryson, Buraimo and Simmons (2017) included France in addition to Germany, Italy and Spain. One of their findings based on the 2000-2015 period was that head coaches in Spain and Italy are much more likely to be dismissed or quit relative to those in France and Germany.

An originality of our paper is to focus on the impact of head coach change on team performance in the French Ligue 1 over the 2000-2016 period. This enables to identify whether the lower likelihood of change in France compared to Spain and Italy is associated with a better impact on team performance, i.e. head coach changes in France would be more likely to occur when this is needed to improve team performance compared to Spain and Italy. Such comparison is possible since Spain and Italy are part of the countries where the impact of a head coach change on team performance has been investigated, with three studies on Spain (González-Gómez, Picazo-Tadeo & García-Rubio, 2011; Lago-Peñas, 2011; Tena & Forrest, 2007) and one on Italy (De Paola & Scoppa, 2012).

Another originality of the paper is to consider the impact of head coach change on team performance in relation to expected performance as measured by betting companies. This variable estimates the expected number of points for a team before each game. It is based on variables usually used in the literature such as home advantage, strength and form of both teams, as well as additional elements such as player injuries and suspensions (On The Ball Bets, n.d.). As such, it is supposed to capture more information than the variables usually tested. However, it remains unclear whether the impact of a head coach (change) is part of this information. The paper enables to test this, thus to advance knowledge on the impact of a head coach change on team performance as well as the information captured by betting companies.

[1] England, France, Germany, Italy and Spain.

The article reads as follows. The next section reviews the literature on the impact of a head coach change on team performance in professional men's football. The method is then explained before describing the data. In the last but one section, results are provided and discussed. Finally, conclusions are drawn, along with limitations and perspectives.

2. Literature review

The impact of a head coach change on team performance in professional men's football has been researched in different countries (12 identified in 32 studies in English, see below and Appendix 1):

- Argentina (Flores, Forrest & Tena, 2012);
- Austria (Wirl & Sagmeister, 2008);
- Belgium (Balduck, Buelens & Philippaerts, 2010; Balduck, Prinzie & Buelens, 2010);
- Colombia (Giraldo, Mendoza, Rosas & Tellez, 2013);
- Denmark (Madum, 2016);
- England (Audas, Dobson & Goddard, 1997, 2002; Besters, Van Ours & Van Tuijl, 2016; Bridgewater, 2010; Desai, Lockett & Paton, 2016; Dobson & Goddard, 2001, 2011; Flint, Plumley & Wilson, 2014; Hughes, Hughes, Mellahi & Guermat, 2010; Poulsen, 2000; Wilson, Plumley & Flint, 2019);
- Germany (Frick & Simmons, 2008; Heuer, Müller, Rubner, Hagemann & Strauss, 2011; Muehlheusser, Schneemann & Sliwka, 2016; Salomo & Teichmann, 2000; Wagner, 2010);
- Italy (De Paola & Scoppa, 2012);
- the Netherlands (Bruinshoofd & ter Weel, 2003; Koning, 2003; ter Weel, 2011; Van Ours & Van Tuijl, 2016);
- Norway (Arnulf, Mathisen & Haerem, 2012);
- Portugal (Maximiano, 2012);
- and Spain (González-Gómez *et al.*, 2011; Lago-Peñas, 2011; Tena & Forrest, 2007).

Table 1 sums up the number of studies as a whole and per country.

Table 1
Number of Studies and Countries Studied on the Impact of a Head Coach Change on Team Performance in Professional Men's Football

Number	Country(ies)
32	12
11	England
5	Germany
4	Netherlands
3	Spain
2	Belgium
1	Argentina, Austria, Colombia, Denmark, Italy, Norway, Portugal

When looking at the impact of a head coach change on team performance, it is necessary to define how to measure performance and how to assess impact. In terms of performance measurement, many studies use the number of points achieved or an indicator capturing a similar information (e.g. win /draw). However, there are also some studies that focus on the goal difference (Balduck, Prinzie *et al.*, 2010; Heuer *et al.*, 2011; Koning, 2003) and others that use both the number of points achieved and the goal difference and / or the number of goals scored and the number of goals conceded (De Paola & Scoppa, 2012; Giraldo *et al.*, 2013; Madum, 2016; Maximiano, 2012; Van Ours & Van Tuijl, 2016).

With regards to assessing the impact of a coach change on team performance, this can be done through the comparison of the means before and after termination, statistical difference tests, regression analyses, stochastic frontier estimation of a Cobb-Douglas production function (Frick & Simmons, 2008) or data envelopment analysis (González-Gómez *et al.*, 2011). A Naive Approach (NA) consists in comparing team performance before and after a coach change. Nevertheless, there is a need for a Control Group (CG), i.e. no coach change for the same team in another season despite a quite similar performance. 18 studies do not incorporate such a CG while 14 do.

Contrasted results are found in the 32 studies identified, including across studies about the same country. 11 studies (5 NA and 6 CG) find no significant impact / improvement, 11 studies (6 NA and 5 CG) a significant negative impact and 10 studies (7 NA and 3 CG) find a significant positive impact. In the three studies finding a significant positive impact and using a CG, the significant positive impact holds true only for teams with the worst runs of form in Poulsen (2000) and only for home matches in Madum (2016). It holds true without making such distinctions in Wagner (2010), although it must be noted that this author looks at the difference of the average number of points awarded to a team in the four games after a coach replacement and the four games before. In other words, Wagner (2010) does not rely on all individual games, nor does he look at the average number of points in all games before and after a coach replacement. His article focuses on the German Bundesliga 1 over the 1963-2003 period. Interestingly, also with a CG approach and for the same league, Heuer *et al.* (2011) find no significant impact over the 1963-2009 period, while Salomo and Teichmann (2000) find a significant negative impact of a head coach change over the 1979-1998 period.

3. Method

Based on the literature review, we chose a CG approach. Following Van Ours and Van Tuijl (2016), we estimated models explaining successively the Number of Points, whether the match was won or not (Win), and the Goal Difference[2]:

$$y_{ijk} = \eta_{ik} + \beta r_{ijk} + \delta d_{ijk} + \varepsilon_{ijk} \quad (1)$$

in which y_{ijk} represents the performance indicator of team i in match j of season k; η_{ik} fixed effects for team-season used to account for the (unobserved) quality of a team in a particular season; r_{ijk} potential determinants of the performance; d_{ijk} whether or not there has been a head coach change; β the vector of parameter estimates; δ the parameter indicating whether a head coach change influences performance; and ε_{ijk} the error term.

In our initial models, our explanatory variables are as follows:

- a dummy for Home Advantage,
- the Position of Team i prior to the Game,
- the Position of the Opponent prior to the Game,
- the Position of the Opponent at the end of the previous Season,
- a dummy for a Head Coach Change for team i in season k (actual head coach change)[3],

[2] In Ligue 1, a win corresponds to 3 points, a draw to 1 point and a loss to 0 point. To account for the discrete character of our dependent variables, we use logit (for Win) and ordered logit (for Number of Points and Goal Difference) models. In order to obtain consistent estimation of the fixed effects ordered logit models, we implemented the BUC estimator in Stata (Baetschmann, Staub & Winkelmann, 2011).

[3] Similar to Van Ours and Van Tuijl (2016), we ignored coach replacements in the first four and the last four matches in every season.

- and a dummy for the CG (Control Group) for team *i*, i.e. team *i* did not sack its head coach in a season other than season *k* while the situation was quite similar to season *k* (head coach change that did not happen).

For the latter, we relied on Van Ours and Van Tuijl (2016) and Besters *et al.* (2016) who used cumulative surprise (CS) to identify a season without head coach change with a performance quite similar to that with head coach change. CS is based on "match surprise", i.e. the difference between the actual and expected number of points for a match, based on the odds of the bookmakers (Stadtmann, 2006). The expected number of points for a match is derived from the odds of the bookmakers as illustrated in the following example. In the 2015-16 season, Marseille played its first match at home against Caen. The quotes before the match were 1.6 for a home win of Marseille, 4.15 for a draw and 6.19 for an away win of Caen. This means that a bettor who put 1 Euro on an away win of Caen received 6.19 Euros. Comparison of the different quotes for this match already highlights that Marseille was regarded as the favourite in this match. Summing up the inverse of the quotes (1/1.6 + 1/4.15 + 1/6.19) yields the mark-up of the betting company. The higher this mark-up, the higher the price for the bet. In the example, the mark-up is 2.75% for the company, i.e. the sum of the inverse of the quotes (1.0275) - 1. By controlling for this mark-up, one can compute the probability implicit in the betting odds for a home win, which amounts to 60.8% [1/(1.6*1.0275)], for a draw that is equal to 23.5% [1/(4.15*1.0275)], and the away team win of 15.7% [1/(6.19*1.0275)], respectively. These implicit probabilities show that Marseille was indeed regarded as the favourite. Having these probabilities at hand, it is possible to calculate the expected number of points for Marseille. Because the winning team receives 3 points, a draw leads to 1 point and a loss 0 point, the expected number of points for Marseille in the match against Caen is equal to 2.06 (3*0.608 + 1*0.235). As Marseille lost this match, the outcome has to be interpreted as a negative "match surprise", with the value of the "match surprise" being -2.06.

CS is the sum of all "match surprises" since the start of the season, i.e. the sum of all the differences between the actual and expected number of points for a match since the start of the season. As noted by Van Ours and Van Tuijl (2016, p. 596), "If this cumulative surprise sinks below a certain threshold, then continuation of the cooperation between club and head-coach might become doubtful." The authors used the CS information in the last match before a head coach change (CS_p, where p indicates the last match of a coach) and the nearest neighbour approach. The latter means that for a particular club we searched for the same club but in a different season a match with the closest CS (CS_c, where c refers to a counterfactual observation, i.e. the CG). Similar to Van Ours and Van Tuijl (2016), we allowed for a maximum difference between the two of 0.5, i.e. $|CS_p - CS_c| \leq 0.5$. Sometimes none of the matches of the same club in a different season had a CS_c such that $|CS_p - CS_c| \leq 0.5$. In this case, none CG was used. Sometimes the same team-season was used several times as CG because its CS_c were several times such that $|CS_p - CS_c| \leq 0.5$ for different CS_p. For example, suppose team *i* changed its head coach when $CS_c = -5$ in season 1 and -6 in season 2. In season 3 when the head coach was not changed, $CS_p = -4.9$ after match 12 and -6.2 after match 18. In this case, season 3 is used as CG for both seasons 1 and 2, with the CG dummy taking the value 0 in matches 1 to 12 and 1 in matches 13 to the end for season 1, and the value 0 in matches 1 to 18 and 1 in matches 19 to the end for season 2. However, the same match should not be used twice with the same information, i.e. the same value for the CG dummy. As such, in the present example, matches 1 to 12 and 19 to the end are used only once (with the CG dummy taking the value 0 and 1, respectively), while matches 13 to 18 are used twice (with the CG dummy taking the value 1 for season 1 and 0 for season 2). Sometimes it was not possible to find a counterfactual head coach change that did not happen as the club with a head coach change was present in the Ligue 1 for just one season.

In alternative models, we replaced Home Advantage, Position of Team *i* prior to the Game, Position of Opponent prior to the Game and Position of Opponent at the end of the previous Season by Expected Performance as measured by betting companies (expected number of points for a match, i.e. the same information used to calculate CS). As mentioned in introduction, Expected Performance is supposed to capture Home Advantage, Position of Team *i*, Position of Opponent and additional information (e.g. form, player injuries / suspensions…; On The Ball Bets, n.d.). First, we tested our models with a single variable for Expected Performance, then with the distinction between Expected Performance Before and After a head coach change (both actual or that did not happen). Expected Performance Before corresponds to the same values as Expected Performance before a head coach change, 0 after; Expected Performance After corresponds to the same values as Expected Performance after a head coach change, 0 before. The idea is that teams were below expectations prior to the head coach change. As such, it is expected that Expected Performance After has a larger coefficient than Expected Performance Before. In these alternative models, if Head Coach Change for team *i* and its CG have no significant impact, this might mean that there is simply a regression to the mean.

4. Data

We collected our data from various internet sources: lfp.fr, racingstub.com/games, transfermarkt.com, oddsportal.com and football-data.co.uk. Table 2 provides information about the number of seasons with head coach change(s) for the different teams and the number of teams that changed their head coaches per season. Over the 2000-2016 period, 79 team-seasons changed their head coaches (4.94 teams changing their head coaches per season in average). Marseille is the team with the highest number of seasons with a change of head coach (7). Lille and Lyon have only 1 season with a change of head coach despite having been in Ligue 1 over the full period and Guingamp none (7 seasons in Ligue 1). 2004-05 and 2015-16 are the two seasons with the highest number of teams having changed their head coaches (10). Interestingly, these two seasons preceded important increases in TV rights in 2005-06 and 2016-17. It might mean that there was more pressure on teams to remain in Ligue 1, with the consequence that head coaches were more likely to be fired.

Table 2

Overview on Team Seasons with Head Coach Changes in Ligue 1 over the 2000-2016 Period

	Number	Team / Season
Overall	79	32 teams with head coach change(s) out of 37 / all seasons with head coach changes
Team[1]	7	Marseille (16)
	5	Paris (16)
	4	AC Ajaccio (7), Lens (11), Nantes (11)
	3	Bastia (9), Bordeaux (16), Le Mans (6), Metz (7), Monaco (14), Montpellier (11), Nice (14), Rennes (16), Saint-Etienne (13), Sedan (4), Sochaux (13)
	2	Brest (3), Evian (4), Reims (4), Strasbourg (6), Toulouse (14), Troyes (7)
	1	Arles (1), Auxerre (12), Caen (7), Le Havre (2), Istres (1), Lille (16), Lorient (11), Lyon (16), Nancy (8), Valenciennes (8)
	0	Boulogne (1), Dijon (1), Gazélec Ajaccio (1), Grenoble (2), Guingamp (7)

Season[2]	10	2004-05, 2015-16
	6	2011-12
	5	2000-01, 2001-02, 2007-08, 2013-14
	4	2002-03, 2006-07, 2008-09, 2010-11, 2012-13
	3	2003-04, 2005-06, 2009-10, 2014-15

[1] Number of seasons in Ligue 1 over the 2000-2016 period in parentheses.
[2] 20 teams per season, except in 2000-01 and 2001-02 (18 teams).

Table 3 provides information about the number of matches played, the position and CS when the head coach change occurred. This information is given for all observations as well as Marseille and Paris: Marseille is the only team for which the head coach quitted after the first match (Marcelo Bielsa in 2015-16, this match corresponding to the example chosen in the method section) whereas Paris is the only team for which the head coach was fired while the team was ranked first at mid-season (Antoine Kombouaré in 2011-12, with the highest CS – equal to 5.13 – among all those corresponding to the last match before a head coach change). 55 team-seasons having changed their head coach were used in our regressions. In average, head coach changes occurred around mid-season, with the team being in the last positions of the ranking and CS being around -5.

Table 3
Number of Head Coach Changes, Number of Matches Played, Position and Cumulative Surprise when the Head Coach Change Occurred in Ligue 1 over the 2000-2016 Period

	Number of Head Coach Changes	Number of Matches Played	Position	Cumulative Surprise
All data				
Average	79	18	16.34	-4.94
Marseille	7	11.71	12.29	-2.44
Paris	5	20.4	10	-4.45
Data used in regressions				
Average	55	17.45	15.55	-4.08
Marseille	6	13.5	11.5	-2.50
Paris	5	20.4	10	-4.45

Table 4 provides information about the mean, minimum and maximum values of each of the variables used in the analysis.

Table 4
Variables Used in the Analysis: Means, Minima and Maxima (N = 3,600 matches, n = 94 team-seasons)

	Mean	Minimum	Maximum
Number of Points	1.25	0	3
Win	0.32	0	1
Goal Difference	-0.11	-6	6
Home Advantage	0.51	0	1
Position of Team *i* prior to the Game[1]	12.70	1	23

Position of Opponent prior to the Game[1]	10.34	1	23
Position of Opponent at the end of the previous Season[1]	10.85	1	23
Head Coach Change Team *i*	0.30	0	1
Control Group	0.23	0	1
Expected Performance	1.31	0.20	2.57
Expected Performance Before	0.61	0	2.47
Expected Performance After	0.70	0	2.57

[1] Position ranked with 1 for the top of the table and 20 for the bottom. For the first game of the season, promoted teams are allocated a position corresponding to the sum of the number of teams in Ligue 1 the previous season and their position at the end of the previous season in Ligue 2. This explains that the position can be more than 20.

5. Results

Table 5 shows that all variables are significant in all our initial models. The coefficients and significances are similar in the points and win models, although some standard errors are slightly different. For this reason, they are not reported for the win models in the following results based on Expected Performance (available upon request). Our results for Head Coach Change Team *i* and Control Group are consistent with Van Ours and Van Tuijl (2016) and Besters *et al.* (2016). They do not enable to conclude to a better impact of one of these two variables over the other.

Table 5
Effects of Head Coach Change on Team Performance – 1st Tests without Expected Performance

	Points	Win	Goal Difference
Home Advantage	0.976*** (0.101)	0.976*** (0.077)	1.083*** (0.162)
Position of Team *i* prior to the Game	0.081*** (0.013)	0.081*** (0.013)	0.045** (0.018)
Position of Opponent prior to the Game	0.036*** (0.007)	0.036*** (0.007)	0.021** (0.010)
Position of Opponent at the end of the previous Season	0.021*** (0.006)	0.021*** (0.006)	0.040*** (0.009)
Head Coach Change Team *i*	0.507*** (0.139)	0.507*** (0.113)	0.362** (0.167)
Control Group	0.477*** (0.147)	0.477*** (0.125)	0.446*** (0.173)
Observations (team-seasons)	3,600 (94)		
Pseudo R^2	0.0773	-	0.0733

Notes: All estimates contain team-season fixed effects; ** and *** for $p<0.05$ and $p<0.01$, respectively; standard errors in parentheses. Prob > chi2 = 0.0000 for all regressions.

We then tested our models in replacing Home Advantage, Position of Team *i* prior to the Game, Position of Opponent prior to the Game and Position of Opponent at the end of the previous Season by Expected Performance / Expected Performance Before and After. Table 6 shows that the results with Expected Performance are consistent with those presented previously, with Head Coach Change Team *i* and Control Group having still a significant positive impact. However, for the results with Expected Performance Before and After, if Head Coach Change Team *i* has still a significant positive impact in the points model, this is not the case anymore for Control Group; in the goal difference model, both variables have no significant impact anymore. The points model may be considered more relevant than the goal difference model. Indeed, Expected Performance is the expected number of points so an explanatory variable closely related to the actual number of points used as dependent variable in the points model. Besides, the number of points is what primarily matters rather than the goal difference. As such, the results showing a significant positive impact of Head Coach Change Team *i* and no significant impact of Control Group may be regarded as the most relevant. If so, this is only the second time that a study finds such results without making distinctions based on the form of the team (Poulsen, 2000) or home / away games (Madum, 2016). The first was the one by Wagner (2010) for the German Bundesliga 1 over the 1963-2003 period, with some limitations mentioned in the literature review.

Table 6

Effects of Head Coach Change on Team Performance – 2nd Tests with Expected Performance

	Points			Goal Difference		
Expected Performance	1.627*** (0.108)	-	-	1.546*** (0.179)	-	-
Expected Performance Before	-	1.630*** (0.148)	1.426*** (0.115)	-	1.537*** (0.212)	1.382*** (0.198)
Expected Performance After	-	1.626*** (0.132)	1.772*** (0.109)	-	1.551*** (0.237)	1.646*** (0.175)
Head Coach Change Team *i*	0.630*** (0.120)	0.636** (0.255)	-	0.426*** (0.150)	0.405 (0.469)	-
Control Group	0.412*** (0.122)	0.418 (0.277)	-	0.444*** (0.177)	0.423 (0.489)	-
Observations (team-seasons)	3,600 (94)					
Pseudo R^2	0.0763	0.0763	0.0750	0.0586	0.0586	0.0582

Notes: All estimates contain team-season fixed effects; ** and *** for $p<0.05$ and $p<0.01$, respectively; standard errors in parentheses. Prob > chi2 = 0.0000 for all regressions.

Interestingly, Expected Performance Before and After have very similar coefficients, while one may have expected that the former would have a lower coefficient than the latter. This is actually the case when Head Coach Change Team *i* and Control Group are removed, consistent with expectations. This suggests that betting companies are not able to capture or adjust for the negative impact on performance of a team operating under a head coach who does not make it play at its expected level, consistent with the existence of negative cumulative surprises.

6. Conclusions, limitations and perspectives

This research was interested in the impact of a head coach change on team performance in the French men's football Ligue 1 over the 2000-2016 period. To assess this, a control group approach was used, i.e. explanatory variables include dummy variables for both a head coach change (head coach change that happened) but also no head coach change for the same team during another season despite a similar performance (head coach change that did not happen). To be able to evaluate when considering that performance was similar, cumulative surprise was used. It consisted in calculating the sum of the differences between actual and expected number of points for each game prior to the head coach change, and found the closest match in another season without head coach change for the same team. Two sets of models were tested: one based on common explanatory variables in the literature such as home advantage and positions in the table for both teams (prior to the game and also at the end of the previous season for the opponent); and another based on expected performance (number of points) as calculated by betting companies. For the second set, a distinction was made between expected performance before and after a head coach change (that happened or did not happen). In the first set of models, results show that both a head coach change and its control group have a significant positive impact on team performance. However, in the second set, there is evidence of a positive impact of a head coach change but no significant impact of the control group. As such, the research provides some evidence that a head coach change may have a positive impact on team performance, contrasting with most of the literature using a control group approach.

The introduction of the paper expressed the idea that head coach changes in France may be more likely to occur when this is needed to improve team performance compared to Spain and Italy. This is partially supported by our results and their comparison with studies about Spain and Italy. In Spain, Tena and Forrest (2007), González-Gómez *et al.* (2011) and Lago-Peñas (2011) found some evidence of a positive impact of a head coach change but their approach did not include a control group. In Italy, De Paola and Scoppa (2012) included a control group and found no significant impact of a head coach change. It remains necessary to apply the same models as for France (in particular with expected performance before and after a head coach change that happened or did not happen) to Spain and Italy for a more reliable comparison.

The introduction of the paper also mentioned the relevance of the topic given the importance of all aspects related to the maximisation of team performance in sports economics and management. Since the paper provides some evidence that a head coach change may have a positive impact on team performance, it supports the idea of considering this option when looking for some ways to improve performance. This is an important management implication given that most literature using a control group approach concludes that a head coach change has no significant or a significant negative impact. However, it must be acknowledged that the results have been found for France and may not be generalizable to other contexts. Moreover, the present research does not enable to identify whether all head coach changes had a significant positive impact on team performance, nor when a head coach should be changed.

A direction may be to look at the efforts produced by players before and after a head coach change that happened (Dietl, García-Unanue & Orlowski, 2018) and did not happen, while controlling for the quality of the opponent (a team being likely to produce more efforts against better teams due to less control of the ball) but also the quality of the team (more efforts produced by the team if it is not able to control the ball, e.g. more passes missed)[4]. Another direction may be a more qualitative approach based on interviews with key actors (presidents, general managers, players) to identify some information that quantitative data might not be

[4] We thank Bernd Frick for having suggested this direction following the communication by Dietl *et al.* (2018).

able to capture, e.g. whether these stakeholders still trusted their head coach when he was fired vs. when he remained head coach.

References

Anderson, C., & Sally, D. (2014). *The numbers game: Why everything you know about soccer is wrong.* (2nd ed.). London: Penguin Books.

Arnulf, J.K., Mathisen, J.E., & Haerem, T. (2012). Heroic leadership illusions in football teams: Rationality, decision making and noise-signal ratio in the firing of football managers. *Leadership, 8*, 169-185. https://doi.org/10.1177/1742715011420315

Audas, R., Dobson, S., & Goddard, J. (1997). Team performance and managerial change in the English Football League. *Economic Affairs, 17*, 30-36. https://doi.org/10.1111/1468-0270.00039

Audas, R., Dobson, S., & Goddard, J. (2002). The impact of managerial change on team performance in professional sports. *Journal of Economics and Business, 54*, 633-650. https://doi.org/10.1016/S0148-6195(02)00120-0

Baetschmann, G., Staub, K.E., & Winkelmann, R. (2011). Consistent estimation of the fixed effects ordered logit models. IZA discussion paper number 5443, Institute for the Study of Labor, Bonn, Germany. Available at http://ftp.iza.org/dp5443.pdf

Balduck, A-L., Buelens, M., & Philippaerts, R. (2010). Short-term effects of midseason coach turnover on team performance in soccer. *Research Quarterly for Exercise and Sport*, *81*, 379-383. https:// doi.org/10.1080/02701367.2010.10599686

Balduck, A.L., Prinzie, A., & Buelens, M. (2010). The effectiveness of coach turnover and the effect on home team advantage, team quality and team ranking. *Journal of Applied Statistics, 37*, 679-689. https://doi.org/10.1080/02664760902824731

Besters, L., van Ours, J.C., & van Tuijl, M.A. (2016). Effectiveness of in-season manager changes in English Premier League football. *De Economist, 164*, 335-356. https://doi.org/10.1007/s10645-016-9277-0

Bridgewater, S. (2010). *Football management*. Basingstoke, UK: Palgrave Macmillan UK.

Bruinshoofd, A., & ter Weel, B. (2003). Manager to go? Performance dips reconsidered with evidence from Dutch football. *European Journal of Operational Research, 148*, 233-246. https://doi.org/10.1016/S0377-2217(02)00680-X

Bryson, A., Buraimo, B., & Simmons, R. (2017). Time to go? Head coach quits and dismissals in professional football. Working paper number 17-07, University College London, London. Available at http://repec.ioe.ac.uk/REPEc/pdf/qsswp1707.pdf

De Paola, M., & Scoppa, V. (2012). The effects of managerial turnover: Evidence from manager dismissals in Italian football teams. *Journal of Sports Economics, 13*, 152-168. https://doi.org/10.1177/1527002511402155

Desai, M.N., Lockett, A., & Paton, D. (2016). The effects of leader succession and prior leader experience on postsuccession organizational performance. *Human Resource Management, 55*(6), 967-984. https://doi.org/10.1002/hrm.21700

Dietl, H.M., García-Unanue, J., & Orlowski, J. (2018). Management dismissals and their effect on employee effort and ability: Evidence from the German Bundesliga. Presentation at the 10th European Sport Economics Association Conference, Liverpool, UK.

Dobson, S., & Goddard, J. (2001). *The economics of football.* (1st ed.). Cambridge, UK: Cambridge University Press.

Dobson, S., & Goddard, J. (2011). *The economics of football.* (2nd ed.). Cambridge, UK: Cambridge University Press.

Flint, S.W., Plumley, D.J., & Wilson, R.J. (2014). You don't know what you're doing! The impact of managerial change on club performance in the English Premier League. *Managing Leisure, 19*, 390-399. https://doi.org/10.1080/13606719.2014.910000
Flores, R., Forrest, D., & Tena, J.D. (2012). Decision taking under pressure: Evidence on football manager dismissals in Argentina and their consequences. *European Journal of Operational Research, 222*, 653-662. https://doi.org/10.1016/j.ejor.2012.03.033
Frick, B., & Simmons, R. (2008). The impact of managerial quality on organizational performance: Evidence from German soccer. *Managerial and Decision Economics, 29*, 593-600. https://doi.org/10.1002/mde.1431
Giraldo, A., Mendoza, J, Rosas, A., & Tellez, D. (2013). Managerial turnover: Coach dismissals and team performance in Colombia. Working Paper, Pontificia Universidad Javeriana, Bogota, Colombia. Available at https://pdfs.semanticscholar.org/ce62/5f5fd9dac08747016184b5eb84c5c27526b3.pdf
González-Gómez, F., Picazo-Tadeo, A.J., & García-Rubio, M.A. (2011). The impact of a mid-season change of manager on sporting performance. *Sport Business and Management: An International Journal, 1*, 28-42. https://doi.org/10.1108/20426781111107153
Graziano, C., & Luporini, A. (2017). Severance agreements, incentives and CEO dismissal. *Economics Bulletin, 37*(1), 440-447. Available at http://www.accessecon.com/Pubs/EB/2017/Volume37/EB-17-V37-I1-P40.pdf
Guzel, P., Onag, Z., & Barutcu, F. (2015). Is midseason coaching chance effective on professional footballers in Turkey? A qualitative research. *British Journal of Education, Society & Behavioural Sciences, 8*, 256-265. https://doi.org/10.9734/BJESBS/2015/17764
Haslam, S.A. (2010). Great person theory of leadership. In J.M. Levine, &. M.A. Hogg (Eds.), *Encyclopedia of group processes & intergroup relations* (pp. 312-313). Thousand Oaks, CA: Sage Publications, Inc.
Heuer, A., Müller, C., Rubner, O., Hagemann, N., & Strauss, B. (2011). Usefulness of dismissing and changing the coach in professional soccer. *PLoS ONE, 6*, 1-7. https://doi.org/10.1371/journal.pone.0017664
Hugues, M., Hugues, P., Mellahi, K., & Guermat, C. (2010). Short-term versus long-term impact of managers: Evidence from the football industry. *British Journal of Management*, *21*, 571-589. https://doi.org/10.1111/j.1467-8551.2009.00668.x
Kattuman, P., Loch, C., & Kurchian, C. (2019). Managerial succession and success in a professional soccer team. *PLoS ONE, 14*(3), 1-20. https://doi.org/10.1371/journal.pone.0212634
Koning, R.H. (2003). An econometric evaluation of the firing of a coach on team performance. *Applied Economics, 35*, 555-564. https://doi.org/10.1080/0003684022000015946
Kuper, S., & Szymanski, S. (2012). *Soccernomics: Why transfers fail, why Spain rule the world and other curious football phenomena explained*. (2nd ed.). London: HarperSport.
Lago-Peñas, C. (2011). Coach mid-season replacement and team performance in professional soccer. *Journal of Human Kinetics, 28*, 115-122. https://doi.org/10.2478/v10078-011-0028-7
Madum, A. (2016). Managerial turnover and subsequent firm performance: Evidence from Danish soccer teams. *International Journal of Sport Finance, 11*, 46-62.
Maximiano, S. (2012). Does replacing a manager improve performance? Working Paper, Purdue University, West Lafayette, IN. Available at https://pdfs.semanticscholar.org/4b7b/3a2f89f97a136d97760d2f22b29e3f5d3b9c.pdf
Molan, C., Matthews, J., & Arnold, R. (2016). Leadership off the pitch: The role of the manager in semi-professional football. *European Sport Management Quarterly, 16*(3), 274-291. https://doi.org/10.1080/16184742.2016.1164211

Muehlheusser, G., Schneemann, S., & Sliwka, D. (2016). The impact of managerial change on performance: The role of team heterogeneity. *Economic Inquiry, 54*, 1128-1149. https://doi.org/10.1111/ecin.12285
Neale, W.C. (1964). The peculiar economics of professional sports: A contribution to the theory of the firm in sporting competition and in market competition. *The Quarterly Journal of Economics, 78*(1), 1-14. https://doi.org/10.2307/1880543
On The Ball Bets (n.d.). How are football odds calculated. Available at https://www.ontheballbets.com/betting-guides/football/how-betting-odds-calculated/
Poulsen, R. (2000). Should he stay of should he go? Estimating the effect of firing the manager in soccer. *Chance, 13*, 29-32.
Rottenberg, S. (1956). The baseball players' labor market. *Journal of Political Economy, 64*(3), 242-258. https://www.jstor.org/stable/1825886
Salomo, S., & Teichmann, K. (2000). The relationship of performance and managerial succession in the German premier football league. *European Journal of Sport Management, 7*, 99-119.
Sloane, P.J. (1969). The labour market in professional football. *British Journal of Industrial Relations, 7*(2), 181-199. https://doi.org/10.1111/j.1467-8543.1969.tb00560.x
Sloane, P.J. (1971). The economics of professional football: The football club as a utility maximiser. *Scottish Journal of Political Economy, 18*(2), 121-146. https://doi.org/10.1111/j.1467-9485.1971.tb00979.x
Stadtmann, G. (2006). Frequent news and pure signals: The case of a publicly traded football club. *Scottish Journal of Political Economy, 53*, 485-504. https://doi.org/10.1111/j.1467-9485.2006.00391.x
Tena, J.D., & Forrest, D. (2007). Within-season dismissal of football coaches: Statistical analysis of causes and consequences. *European Journal of Operational Research*, *181*, 362-373. https://doi.org/10.1016/j.ejor.2006.05.024
Ter Weel, B. (2011). Does manager turnover improve firm performance? Evidence from Dutch soccer, 1986-2004. *De Economist, 159*, 279-303. https://doi.org/10.1007/s10645-010-9157-y
Terrien, M., Scelles, N., Morrow, S., Maltese, L., & Durand, C. (2017). The win/profit maximization debate: Strategic adaptations as the answer? *Sport, Business and Management: An International Journal, 7*(2), 121-140. htpps://doi.org/10.1108/SBM-10-2016-0064
Van Ours, J.C., & Van Tuijl, M. (2016). In-season head-coach dismissals and the performance of professional football teams. *Economic Inquiry, 54*, 591-604. https://doi.org/10.1111/ecin.12280
Wagner, S. (2010). Managerial succession and organizational performance: Evidence from the German soccer league. *Managerial and Decision Economics, 31*, 415-430. https://doi.org/10.1002/mde.1495
Wilson, R., Plumley, D., & Flint, S.W. (2019). Making sense of the sack race: The impact of managerial change in the English Premier League. *Sport, Business and Management: An International Journal.* https://doi.org/10.1108/SBM-10-2018-0079
Wirl, F., & Sagmeister, S. (2008). Changing of the guards: New coaches in Austria's premier football league. *Empirica*, 267-278. https://doi.org/10.1007/s10663-008-9063-6

Appendix 1

Synthesis of the Main Elements Related to the Previous Studies on the Impact of Head Coach Change on Team Performance in Men's Football[1]

Author(s)	Sample	Performance measurement	Method	Naive Approach (NA) vs. Control Group (CG)	Results
Audas, Dobson & Goddard (1997)	English Football (and Premier) League 1972-1993, 42,624 matches	Win ratio	Mean comparison 6, 12 and 18 matches before / after	CG	CG better than TG[2] but significance not tested
Poulsen (2000)	Top two English leagues 1993-1998, 2,479 matches	Excess points = actual - expected points	Mean comparison 6 matches before and 3 after	CG	TG significantly better than CG only for teams with the worst runs of form
Salomo & Teichmann (2000)	German Bundesliga 1 1979-1998	Number of points	Regression	CG	Significant negative impact
Dobson & Goddard (2001)	English Football (and Premier) League 1972-1999, 53,820 matches	Home win / draw / away win	Ordered probit model Up to 20 matches after (individual and cumulative)	NA	Significant negative impact
Audas, Dobson & Goddard (2002)	English Football (and Premier) League 1972-2000, 55,766 matches	Home win / draw / away win	Ordered probit model Up to 20 matches after (cumulative)	NA	Significant negative impact
Koning (2003)	Dutch Eredivisie 1993-1998, 1,530 matches	Goal difference = home advantage + team quality difference	Regression	NA	Significant positive impact only in 1993-1994, no significant impact otherwise
Bruinshoofd & ter Weel (2003)	Dutch Eredivisie 1988-2000, 1,184 matches	Four-game point average divided by	Before-after analysis and difference-in-	CG	CG significantly better than TG (forced resignations)

		the seasonal average of points per game	differences estimation Distinction forced / voluntary resignations 1 to 4 games before and after		
Tena & Forrest (2007)	Spanish La Liga 2002-2005, 1,050 observations	Home win / draw / away win	Ordered probit model Up to 7 home and away games after termination (individual and cumulative)	NA	Significant positive impact for home games
Frick & Simmons (2008)	German Bundesliga 1 1981-2003, 398 observations	Log points ratio (as proportion of maximum attainable in a given season)	Stochastic frontier estimation of a Cobb-Douglas production function	NA	Significant negative impact
Wirl & Sagmeister (2008)	Austrian Bundesliga 1994-2004, 1,979 observations	Home win / draw / away win	Ordered probit model Up to 5 home and away games after termination (individual)	NA	No significant impact
Balduck, Buelens & Philippaerts (2010)	Top three Belgian leagues 1998-2003, 1,464 observations (864 TG vs. 600 CG)	Four-game point average divided by the seasonal average of points per game	Repeated measures analysis of variance Games 1 through 4 after turnover Not explained vs. explained by regression to the mean	CG	Significant negative impact (significant positive impact for CG vs. no significant impact for TG)

Balduck, Prinzie & Buelens (2010)	Belgian Jupiler League 1998-2005, 2,142 observations	Goal difference = home advantage + team quality difference + team-specific change in team quality	Regression	NA	No significant impact (significant positive impact only in 8 out of 45 cases)
Bridgewater (2010)	English Premier League 1992-2008	Average points per game 1-6, 7-12 and 13-18 games before and after sacking manager	Comparison before / after	NA	Positive impact 1-12 games but significance not tested
Hughes, Hughes, Mellahi & Guermat (2010)	English Premier League 1992-2004, 9,193 observations	Home win / draw / away win	Ordered probit model 3 dummies for 10 matches before, 10 matches after and 11^{th} to 40^{th} match after	NA	Significant negative impact for dummies 10 matches before and 11^{th} to 40^{th} match after, no significant impact for dummy 10 matches after
Wagner (2010)	German Bundesliga 1 1963-2003, 485 observations	Difference of the average number of points awarded to a team in the 4 games after a coach replacement and the 4 games before	Regression	CG	Significant positive impact
Dobson & Goddard (2011)	English Football (and Premier) League 1972-2009, 74,180 matches	Home win / draw / away win	Ordered probit model Up to 20 matches after (individual and cumulative)	NA	Significant negative impact

Heuer, Müller, Rubner, Hagemann & Strauss (2011)	German Bundesliga 1 1963-2009, 14,018 observations	Goal average	Comparison TG / CG	CG	No significant impact
ter Weel (2011)	Dutch Eredivisie 1986-2004, 3,168 observations	Four-game point average divided by the seasonal average of points per game	Before-after analysis and difference-in-differences estimation 1 to 4 games before and after	CG	TG significantly better than CG in game 1 but CG significantly better than TG in games 3 and 4
González-Gómez, Picazo-Tadeo & García-Rubio (2011)	Spanish La Liga 2001-2009, 160 observations	Points obtained at the end of the season and the extra matches played in other competitions	Data envelopment analysis to assess technical efficiency	NA	Significant positive impact but performance significantly lower than teams that did not change managers
Lago-Peñas (2011)	Spanish La Liga 1997-2007, 2,878 observations	Win ratio	Statistical difference tests and OLS regressions Comparison 1, 2, 3, 5, 10, 15 and 20 matches before and after a coach change	NA	Significant positive impact but only in the short term
Flores, Forrest & Tena (2012)	Argentinian Liga A 1986-2006, 7,000 observations	Home win / draw / away win	Ordered probit model Up to 8 home and away games after (individual and cumulative)	NA	Significant negative impact in away games, also in home games but only from game 7 (cumulative)
De Paola & Scoppa (2012)	Italian Serie A 1997-2009, 4,042 observations	Number of points per game, and number of goals scored and	Ordered probit and bivariate Poisson models with matching estimates	CG	No significant impact

		number of goals conceded	of the average treatment effect for 1, 4 and 8 matches per each treated unit		
Arnulf, Mathisen & Haerem (2012)	Norwegian Tippeligaen 1994-2006, 44 observations (29 TG vs. 15 CG)[1]	Average points won during the last five matches	Statistical difference test (ANOVA) over the 15 matches after a coach change	CG	Significant negative impact
Maximiano (2012)	Portuguese SuperLiga 1999-2005, 3,672 observations	Average points in the five matches before / after Log odds position and its square Average goals scored and conceded	Regressions Matching estimates of the average treatment effect	CG	Significant negative impact
Giraldo, Mendoza, Rosas & Tellez (2013)	Colombian Categoría Primera A 2003-2010, 5,600 observations	Number of points per game and goal difference	Two-stage-least-squares regressions	NA	No significant impact
Flint, Plumley & Wilson (2014)	English Premier League 2003-2013, 53 observations	Average points per match and league position	Paired t-test Distinction top half (10 observations) / bottom half (43 observations)	NA	Significant positive impact for bottom half clubs, no significant impact for top half clubs
Madum (2016)	Danish Superligaen 1995-2014, 3,762 observations	Number of points	Ordered probit and OLS regressions Distinction home / away teams Matching estimates of the average treatment effect for	CG	Significant positive impact for home teams, no significant impact for away teams

			1, 3 and 5 matches per each treated unit for home teams		
Besters, Van Ours & Van Tuijl (2016)	English Premier League 2000-2015, 5,700 observations	Number of points	OLS regressions	CG	No significant impact
Muehlheusser, Schneemann & Sliwka (2016)	German Bundesliga 1 1994-2010, 4,263 observations	Number of points	OLS regressions Distinction home / away and homogeneous / heterogeneous teams	NA	Significant positive impact but only for homogeneous teams
Van Ours & Van Tuijl (2016)	Dutch Eredivisie 2000-2014, 3,128 observations	Number of points Win Goal difference	OLS, probit and ordered probit regressions	CG	No significant impact
Desai, Lockett & Paton (2016)	English Premier League 1995-2010, 4,452 observations	Number of points	Ordered probit regressions	NA	Significant negative impact
Wilson, Plumley & Flint (2019)	English Football Leagues 2000-2016, 2,816 observations	Average points per match and league position	T-tests and repeated measures one-way ANOVA	NA	Significant positive impact, more beneficial for bottom half clubs

[1] We have not included the study by Guzel, Onag and Barutcu (2015) on Turkish football, Molan, Matthews and Arnold (2016) on Irish football and Kattuman, Loch and Kurchian (2019) on a European professional football club. In the former, the authors ask for professional footballers' qualitative assessment about the impact of a coach change on their psychology and performance, e.g. motivation, physical performance and discipline. They do not really measure team performance but rather some of its supposed determinants as perceived by players. Molan *et al.* (2016) ask first-team managers, players and board members from semi-professional clubs in the League of Ireland about the manager's leadership off the pitch. Since our focus is on performance on the pitch, this study is not relevant here. Kattuman *et al.* (2019) obtained access to a whole season of daily close observation of a team and coaching staff in practice and matches and use quantitative and qualitative data to go beyond the "average" pattern reported in the literature. As such, their study differs from those summarised here.

[2] Treatment Group.

[3] General linear model in addition to ANOVA, 2,184 observations.