An econometric evaluation of the firing of a coach on team performance.

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Abstract

Firing the manager is a drastic measure employed by firms to deal with poor performance. However, data on within-firm dynamics are scarce, and the firing of individual managers is rarely recorded in the firm level data currently available. This makes the value of firing a manager difficult to assess. Data on sports offer a unique opportunity to study this phenomenon because the firing of a coach is usually well-publicized. Using data on soccer, the author evaluates the effect of the firing of a coach on team performance. As teams do not face the same opponents before and after a coach is fired, the issue of sample selectivity is addressed.

Keywords: Poisson models, soccer, rating models

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1 Introduction

Managers are usually held accountable for the performance of the firm for which they work. If the results fall short of expectations, they may be fired or they may get another perhaps less prestigious position in the same firm. For economists it is very difficult to assess whether this action by the board improves the profitability (or any other measure of performance) of the firm since these changes in management are not usually observable from standard firm level data. Only changes in top-level management are announced if the firm is required to do so because of the ownership structure. In sports, however, data on the performance of teams and on the dismissal of coaches is publicly available.

Using data on soccer, we examine whether firing a coach leads to improvement of the performance of the team. Folklore has it that replacement of a coach leads to a 'shock'-effect; this improves the performance of a team.

The paper is set up as follows. Section 2 provides a discussion of related studies. Section 3 discusses data and presents some preliminary evidence which indicates that firing a coach improves performance. However, this preliminary evidence is misleading as it does not account for differences in the order of play. That is, the old and new coaches do not face the same opponents. Two statistical models that control for this type of sample selectivity are fitted later in the paper. They reveal that firing a coach in fact does not improve team performance.

2 Changing Managers and Coaches: Some Findings in the Literature

Textbook economic theory would suggest that a firm replaces a manager to increase profit (or reduce loss). If this is indeed the case, then profits should increase after a firing decision. In theory, one could compare profits under the old manager to profits under the new manager to see if performance has improved. However, there are three difficulties with this seemingly straightforward approach.

The first difficulty is the measurement of performance. In theory, profit maximization may be the objective of a firm. In practice, however, the performance of a firm is difficult to measure, and in fact, different managers in an organization can pursue different objectives. The intended effect of firing a manager may be different from increasing profit. A manager may be fired to appease shareholders or to demonstrate that the firm can be ‘tough’ on poor performance. The second difficulty is observing if and when a manager is fired. Firm level data disclosing the duration of employment of individual employees are difficult to find. Firm level data are usually in such aggregated form that it is not possible to observe the firing of an individual manager.

Even if the performance of a firm can be precisely defined and measured and the firing of a manager is recorded, there remains a third difficulty. The old and the new manager invariably face different conditions. This makes it difficult to assess what part of the change in performance is due to the change of manager, and what part is due to the change in the conditions faced by the two managers.

The issues mentioned above are addressed only partially in the literature on changes in performance and its relationship to changes in management. There exist in fact two streams of the literature to which this paper is related: one in finance and the other in the statistical analysis of sport outcomes. Most of the studies in the finance literature on managerial change and performance focus on the reverse question: what are the factors that lead to a change in management? For example, in a study on the relation between a firm’s stock return and subsequent management changes, Warner, Watts, and Wruck (1988) find that a firm’s share performance and the probability of a management change are negatively related. They also examine if the announcement of a management change results in any abnormal stock returns, but find little evidence of this effect. While Warner, Watts, and Wruck (1988) examine the effect of the announcement of a new manager, they do not examine whether the performance of stock returns actually improve under the new manager.

The latter issue is addressed in papers by Denis and Denis (1995) and more recently by Khurana and Nohria (2000). Using the ratio of operating income before depreciation to operating assets as the measure of performance, Denis and Denis find ‘that forced resignations of top managers are preceded by large and significant declines in operating performance and followed by large improvements in performance.’ They conclude that there are valuable operating improvements associated with forced resignations. Khurana and Nohria use a similar measure of firm performance to assess whether forced management turnover leads to improvements of performance. They propose a model in which the departure of the existing manager and the origin of the incoming manager are analyzed simultaneously. Using a random-effects panel data approach to model firm performance, they find that natural management turnover followed by an insider has little effect on firm performance, but that forced turnover followed by an outside successor improves the performance significantly.

The studies just discussed use financial measures of performance to assess the performance of a firm. For sport teams in general and soccer teams in particular, financial measures of success are less relevant. Only few soccer teams are listed as publicly traded firms on stock exchanges. The aims of a team are usually more clear than the goals of a firm: teams want to end a competition as highly ranked as possible.

The coach of a team has an important role in determining the ranking of team as he trains the team and determines the line-up. Moreover, he is one of the managers of the club who has an important task in determining which player is hired and which player is put on the transfer list. A coach's responsibilities are to provide training and guidance to players which translates into more wins and a higher ranking in the league.

There is a number of reasons why a coach may be fired. The reason cited most often is the existence of a 'shock'-effect: the new coach is able to motivate the players better, and therefore is able to improve results. Coaches work under high media and fan pressure. If results fall short of expectations, or if the quality of the play does not live up to expectations, pressure may mount to fire the coach. The general public is willing to pay to see winners, less so to see losers. Moreover, it is important for teams to be successful, because transfers of players from successful teams to other teams are more valuable, and hence the return on investments into these players is higher.

The effect of changing a coach has been studied before, see for instance Van Dalen (1994), Scully (1995), and Brown (1982). Van Dalen's paper discusses whether firing the coach of a soccer team improves performance. He estimates a model in which the dependent variable is the difference between the goals scored by the two teams which play each other in a particular game. The independent variables are a measure of the quality of the referee, a measure that captures the difference in team quality, a dummy variable indicating a home game, the result of the previous game, and a trend. He estimates this model for each team in the competition, and he extends the model with a dummy variable which indicates that the new coach has taken over. Using data for the 1993/94 season only, he finds that all coach changes have a positive effect on the goal difference, and the effect is significantly positive in three of the five cases.

The study of Van Dalen has two drawbacks. The most important drawback is that the model used for the goal difference depends on the ranking of both teams *at the moment the game is played*. As we will argue later, this may bias the results because of the non-random order of play. Another drawback of the approach of Van Dalen is that he uses data for one season only. By extending the sample period to more seasons we can assess whether a firing effect, if any, is similar across seasons or not.

Another contribution from the sports literature is Scully (1995). In chapter 8, he examines changes of coaches in baseball and basketball between consecutive seasons. In his empirical analysis, Scully estimates binary choice models where the decision whether or not to terminate the contract of the coach is the dependent variable, and the ranking at the end of the season is the (only) independent variable. He finds that the probability that a contract is terminated is significantly positively related to the ranking for almost all teams in baseball and basketball. On average, a one-rank increase in club standing increases the average probability of firing by 0.066% and 0.077% percent in baseball (National League and American League respectively) and by 0.11% in basketball. He then proceeds to regress the change in ranking between two seasons on the status of the coach. He finds that in almost all cases the decision to fire the coach was rational, with the average improvement in ranking being approximately 1 in baseball and 2/3 in basketball.

Scully analyzes the termination of the contract of a coach *between* seasons. This makes his approach less relevant for soccer, as the composition of teams in soccer usually changes significantly between seasons. Moreover, in soccer, coaches are fired both during the season and between seasons.

In contrast to Scully, in this paper we restrict attention to coach changes during the season. By focusing on coach changes during the season we can measure the coach-effect better, since the pool of players that new coach can use is not very different from the one the old coach faced.

Brown (1982) also analyzes coach changes during seasons and uses data from the National Football League (NFL) over the 1970-1978 period. He estimates a random effect panel data model in which performance (the percentage of wins) is explained by lagged performance, a succession dummy, and a (random) individual effect. He finds that a change of coach in the current season costs 11% in the percentage of games won. Since a season consists of 14 games, this means that it costs a little bit more than one game won during the season. Because it is difficult to hire

	Number of coaches fired	APG old	APG new	$\bar{N}$ old	$\bar{N}$ new	$\bar{M}$ old	$\bar{M}$ new
1993/94	4	0.50	1.30	0.90	1.28	2.26	1.61
1994/95	7	1.01	1.26	1.31	1.68	1.84	1.88
1995/96	8	0.98	1.04	1.43	1.10	1.91	1.80
1996/97	4	1.03	1.43	1.19	1.36	1.70	1.39
1997/98	5	0.66	1.08	1.26	1.46	2.26	1.48

Table 1: Descriptive statistics

new players during the season, he interprets this finding as ritual scapegoating by the board of a team, necessary to appease fans and press media.

3 Data and Descriptive Measures

We use data on the soccer teams that make up the Dutch premier league (the highest division in The Netherlands) for the five seasons between 1993/94 and 1997/98. The unit of observation is a game. The date when each game is played and the final score are recorded. If a coach was fired during a season, the date of firing is recorded as well. A detailed listing of all coach changes within these seasons is given in Appendix A.

In this paper, we focus on the results on the field as a measurement of team performance. We assume that the board of soccer teams want their team to be as high as possible in the ranking. Dutch soccer teams are usually foundations without a profit objective, and there are no franchises that can be traded. The teams are managed by a board, and the board appoints a coach. Considering the recent commercialization of soccer, one may wonder whether a high ranking in the league is the only aim of the board of a soccer team. For instance, the board may want to maximize shareholder value instead of the results on the field. Since no Dutch teams were listed on the stock exchange during the period considered, this issue is not addressed in this paper.

We focus on the 18 teams in the Dutch premier league. We restrict ourselves to coach changes that are not caused by outside offers to the coach. Instead, we focus on changes that are initiated by the management of the club because these changes are initiated to improve performance. At first glance, this may appear to introduce sample selection because it is known from the labor market literature that an employee who anticipates being fired may quit to avoid any stigma effect of a firing. Therefore, it has been argued that the distinction between quits and layoffs is unclear. However, vacancies in coach positions are rare during the season, and a coach who anticipates being fired is extremely unlikely to be able to generate an outside offer. There exists a 'class' structure for coaches in the Dutch premier league. That is, a coach who either quits or gets fired from one team in the premier league usually finds another position in the same league. This makes the pool of potential employers of a coach (who anticipates being fired) limited. Hence, outside offers can only be generated if another team has a vacancy or just fired a coach, and that is a rare coincidence.

A first sketch of the number of coaches fired and their effects is given in table 1. If one keeps in mind that only 18 teams participate in the premier league, it is clear from the second column of table 1 that coach dismissals are not uncommon.

Note that in soccer, a game won yields three points, a draw one point, and a loss zero points. The number of points determines the ranking. The column labeled AGP contains the average number of points per game for the old and new coach (we average over teams that change coaches). We see that on average the new coach earns more points with his team. Moreover, we see that in most seasons the average number of goals per game increases ($\bar{N}$), and that the number of goals conceded ($\bar{M}$) decreases on average. Based on this eyeball interpretation of the data, one would conclude that firing the coach of an underperforming team is a sensible strategy as results then improve.

This conclusion, however, may not be correct. The old coach and the new coach do not play the same opponents. Coaches are not fired randomly throughout the season, but usually after a spell of disappointing results. There can be two explanations for these losses: the team is underperforming or suffers from bad luck (in other circumstances the team could have won some of these games), or the other teams are simply better. Since the schedule of the competition is fixed, it is possible that the old coach started the season by playing tough opponents. If he gets fired and a new coach takes over, the new coach faces the lesser teams in the competition, and wins his games. It is difficult to attribute the improvement in results to changes in the coach as there are quality differences among teams and the order of play is non-random. Hence, any precise measurement of the coach effect should allow for randomness of results, and for quality differences among the opponents of the team. This is the subject of the next section.

4 The Effect of Firing a Coach

As argued in the previous section, it is not satisfactory to compare the average number of points gained (or other measures of team performance like the number of goals scored or the percentage of games won) by the old coach with the average number of points gained by the new coach. In this section, we will use two different approaches to correct for this potential bias. First, we estimate a model that ranks teams and second, we estimate a model for the number of goals scored in home and away games. In both models we examine whether the presence of a firing effect can be detected. In both models the explanatory variables include the quality of the opposing team and therefore these models correct for any bias introduced by the non-random schedule of play.

First, we characterize teams by two parameters: the quality of the team and the home advantage of the team. We will test whether these parameters change after the coach is fired. Different methods have been proposed to measure such quality, see among others Stefani (1980), Clarke and Norman (1995), Kuk (1995), and Koning (2000). The model used here is similar to that of Stefani, and Clarke and Norman.

Consider a game between two teams indexed i and j. In what follows, the team indexed i will be the team that plays a home game while team indexed j (the opponent of team i) is the away team[1]. The number of goals scored by team i against team j is denoted by N_{ij}, and the number of goals conceded by the home team is M_{ij}. The goal difference is defined as $D_{ij} = N_{ij} - M_{ij}$. The quality of team i is denoted by θ_i, and the goal difference is related to the difference of quality between both teams. The goal difference D_{ij} is assumed to have the following form:

$$D_{ij} = h_i + \theta_i - \theta_j + \epsilon_{ij} \tag{1}$$

where h_i a parameter that denotes home advantage. The term h_i may be interpreted as the expected win margin if team i would play a home game against a team of equal quality (that is, if $\theta_i - \theta_j = 0$). ϵ_{ij} is a mean zero error term that has constant variance. If D_{ij} is positive, we expect team i to win, if it is negative, we

[1] Home advantage is strong in soccer: approximately 50% of all games in the history of Dutch soccer are won by the home team, 25% are won by the away team, and 25% end in a draw, see Koning (2000).

expect team j to win. In model (1) team i can win against team j even if it is of inferior quality ($\theta_i - \theta_j < 0$) if the home advantage of team i is big enough. Note that not all parameters in equation (1) are identified, so we impose the identifying restriction $\sum_i \theta_i = 0$: the quality parameters can be interpreted as deviations from a hypothetical average team with quality 0. The home advantage h_i is allowed to vary between teams; in the empirical results we find that the restriction of constant (over teams) home advantage is rejected.

It is now straightforward to measure the effect of a change of coach in model (1): we allow both the parameters that captures the home advantage and the quality parameter θ_i to vary. We estimate the following two extensions to model (1) for those teams that fire a coach during the season:

$$h_i^n = h_i^o + k_i, \qquad i \in \mathcal{F} \tag{2}$$

$$\theta_i^n = \theta_i^o + \psi_i, \qquad i \in \mathcal{F}, \tag{3}$$

with the superscript referring to either the new coach (n) or the old coach (o) and $\mathcal{F}$ is the set of teams that fired a coach during the season. k_i measures the change in home advantage and ψ_i measures the change in team quality. Besides testing whether the k_i's and ψ_i differ jointly from 0, we also test whether they are constant over teams that fire their coach : $k_i = k$ and $\psi_i = \psi$ for all i.

The extensions (2) and (3) makes a firing effect, if any, easily interpretable. Let team i face an opponent of equal quality in a home game so that $\theta_i^o - \theta_j = 0$. Under the old coach, the expected goal difference is h_i^o, under the new coach it is $h_i^o + k_i + \psi_i$, a change of $k_i + \psi_i$. Should this game be played away, the expected change of goal difference is ψ_i. Hence, if there is a positive firing effect we would expect both $\psi_i > 0$ and $k_i > 0$.

Summaries of the results of the estimation of model (1) with extensions (2) and (3) are given in table 2. More detailed information on the estimation results by teams that changed coaches can be found in Appendix B. Because of the large number of parameters that are estimated for each model[2], we only give some summary statistics in table 2: the second column contains the R^2 of the basic model (1), the third column extends that model by allowing for changing home advantage (equation (2)), the fourth column (labeled ψ_i) allows for changing quality (equation (3)), the fifth column (labeled k_i, ψ_i) allows for both changing home advantage and team

[2]The number of parameters that is estimated varies between 35 (basic model) and 51 (1995/96 season, unrestricted model).

quality. Finally, in column six (labeled k) we impose the constraint that the change in home advantage is equal for all teams ($k_i = k$), and in column seven we impose a fixed change in team quality ($\psi_i = \psi$). In the last column we give estimation results where we assume that the changes in home advantage and team quality are similar accross teams that changed the coach ($k_i = k$ and $\psi_i = \psi$ for all $i \in \mathcal{F}$). The point estimates for k and ψ are also given where applicable.

The picture that emerges from table 2 is rather mixed. The results for the 1993/94 season indicate that there is a significant coach-effect, that is, performance improves after a coach is fired. The detailed results in table 5 show that for all teams that changed coach, both the quality improved ($\psi_i > 0$) and the home advantage improved ($k_i > 0$). These results are in line with those documented by Van Dalen.

This remarkable result, however, is specific to the 1993/94 season and we do not find such strong results for later seasons. For all seasons we tested the restriction whether the change of home advantage and the change of quality is constant among teams that fired a coach (that is, whether $k_i = k$ and $\psi_i = \psi$ for all teams that change a coach). It is only for the 1994/95 season that this restriction is rejected with a p-value of 0.041, so we restrict our attention to the estimation results in the last column of table 2. As concluded above, it is only for the 1993/94 season that we find the result that the change of coach significantly improves both home advantage and team quality. For the 1996/97 season we find that home advantage changes significantly, but the change of team quality is insignificant and negative. The other seasons do not show any significant improvements in home advantage and team quality. The finding that a coach change may or may not improve home advantage and/or team quality is corroborated by the detailed regression results listed in Appendix B: team quality *decreases* for 11 out of 28 changes and home advantage decreases 10 times.

These conclusions are at odds with the ones based on the descriptive statistics in section 3. There, the average goal difference improves when a new coach is appointed, except for the 1995/96 season. When quality differences among opponents is corrected for, the coach effect disappears. The conclusions based on the descriptive statistics in table 1 are based on sample selectivity.

It could be argued that a firing effect, if any, is only temporary. We tested for a temporary succession effect by letting the dummy variable that indicates the new coach take value 1 for his first two or four games, and 0 after those games. This

	h, θ	k_i	ψ_i	k_i, ψ_i	k	ψ	k, ψ
1993/94							
R^2	0.312	0.337*	0.342*	0.349	0.328*	0.335*	0.336*
k	-	-	-	-	1.538*	-	1.261
ψ	-	-	-	-	-	0.977*	0.343
1994/95							
R^2	0.373	0.392	0.419	0.423	0.373	0.377	0.377
k	-	-	-	-	0.089	-	−0.312
ψ	-	-	-	-	-	0.410	0.571
1995/96							
R^2	0.484	0.503	0.482	0.506	0.484	0.485	0.485
k	-	-	-	-	−0.185	-	−0.081
ψ	-	-	-	-	-	−0.175	−0.139
1996/97							
R^2	0.367	0.378	0.371	0.397	0.378*	0.367	0.380*
k	-	-	-	-	1.000*	-	1.386*
ψ	-	-	-	-	-	0.272	−0.423
1997/98							
R^2	0.465	0.484	0.496*	0.496	0.468	0.476*	0.476
k	-	-	-	-	0.600	-	−0.157
ψ	-	-	-	-	-	0.851*	0.932

Table 2: Summary of estimation results ranking model, * indicates significance at 5%-level with the null model the model of the second column.

temporary coach effect turned out to be insignificant in almost all seasons. For the 1995/96 season we find that the team under the new coach performs significantly worse during the first two games! In that season, there is no significant coach effect during the first four weeks. According to these results, a temporary improvement in results can not be found.

In the model used above, there is no distinction between goals scored and goals conceded: the dependent variable is the goal difference. According to popular belief, new coaches try to improve the defense so that any losing streak is ended. It is possible that such an extra defensive effort reduces the offensive efforts of the team. In this case we may not observe any change of goal difference as the decrease in goals conceded is offset by a decrease of goals scored. Therefore, it is of interest to analyze the number of goals scored and conceded separately, and see if they are influenced by a change of coaches during the season.

To answer this question, we use a variant of the Poisson model for soccer scores developed by Maher (1982). We assume that N_{ij} (the number of goals scored by team i against team j in a home game) follows a Poisson distribution with parameter λ_{ij}. This parameter will be referred to as the scoring intensity. We assume that

$$\lambda_{ij} = \alpha_i \beta_j, \tag{4}$$

where α_i measures the offensive skills of team i. The parameter β_j captures the defensive skills of team j. Our statistical model for the number of home goals is $N_{ij} \sim \mathcal{P}(\lambda_{ij})$. Again, not all parameters $\alpha_i, i = 1, \ldots, I$ and $\beta_j, j = 1, \ldots, I$ are identified. We impose the identifying restriction $\sum_{j=1}^{I} \beta_j = I$. The expected number of goals of team i if it would play against the defense of every team in the league (including its own) is now

$$\mathcal{E} \sum_j N_{ij} = \sum_j \alpha_i \beta_j = I \alpha_i$$

because of the normalization mentioned above. Hence, we can interpret α_i as the expected number of goals team i would score if the identity of the opponent is unknown. We assume a similar model for M_{ij} (the number of goals conceded by team i when it plays a home game against team j). M_{ij} is also assumed to follow a Poisson distribution with parameter μ_{ij}, and

$$\mu_{ij} = \gamma_j \delta_i. \tag{5}$$

Again we impose $\sum_{i=1}^{I} \delta_i = I$. We assume that N_{ij} and M_{ij} are uncorrelated. In fact, the correlation over the 1993/94-1997/98 period is slightly negative -0.19, but the analysis is simplified tremendously when we make the zero correlation assumption.

The approach to measuring whether a new coach has better results in terms of goals scored and goals conceded is similar to the approach taken in the rating model discussed earlier. First, we estimate a model for scoring intensities both in home and away games, and then examine whether these intensities have changed under the new coach.

In the interest of fitting a pasimonious model, we estimated α_i, β_i, γ_i, and δ_i without any restrictions, and then we tested whether any restrictions could be imposed. The only restriction we could not reject for all seasons at the 5%-level of significance was $\alpha_i = k\gamma_i$: the average offensive capabilities of a team in an away game are proportional to its average offensive capabilities in a home game. The parameter k can be interpreted as a measure of home advantage, as it is the ratio of the expected number of goals in a home game to the expected number of goals in an away game. According to the restriction $\alpha_i = k\gamma_i$, this ratio is the same for each team. Of course, we found $k > 1$ for all seasons. Defensive capabilities vary between teams between home and away games: some teams defend better at home and some defend better in an away game.

Using the specification $\lambda_{ij} = \alpha_i\beta_j$ and $\mu_{ij} = k\alpha_i\delta_j$, we tested whether offensive and defensive capabilities vary between the old coach and the new coach by allowing the parameters α_i, β_i, and δ_i to vary between the old coach and the new coach:

$$\alpha_i^n = \alpha_i^o \cdot \phi_i, \qquad i \in \mathcal{F}$$
$$\beta_i^n = \beta_i^o \cdot \zeta_i, \qquad i \in \mathcal{F}$$
$$\delta_i^n = \delta_i^o \cdot \xi_i, \qquad i \in \mathcal{F}.$$

$\mathcal{F}$ is the set of teams that fired a coach. The estimation results are summarized in table 3 in the second column (labeled ϕ_i, ζ_i, ξ_i). In this column, the p-values are reported that correspond to the hypothesis $\phi_i = \zeta_i = \xi_i = 1$ for all teams that fired their coach. This is the null-hypothesis of no coach effect: the new coach is not able to improve either the offensive skills or defensive skills of the team. We see that the that firing a coach has no effect is rejected marginally for the 1994/95 season and not rejected for any other season.

	ϕ_i, ζ_i, ξ_i	ϕ, ζ		
	p-value	p-value	ϕ	ζ
1993/94	0.17	0.0033	1.39	0.65*
1994/95	0.046*	0.25	1.24	0.96
1995/96	0.15	0.052	0.79	0.89
1996/97	0.24	0.28	1.19	0.82
1997/98	0.089	0.033	1.15	0.69*

Table 3: p-value's Poisson models, * indicates significance at 5%-level.

We also examined whether any firing effect is present in this model by estimating a slightly more restricted alternative model. In this model, we tested again whether offensive and defensive capabilities have changed, but now we assume that the effects (if any) are constant across teams:

$$\alpha_i^n = \alpha_i^o \cdot \phi, \qquad i \in \mathcal{F}$$
$$\beta_i^n = \beta_i^o \cdot \zeta, \qquad i \in \mathcal{F}$$
$$\delta_i^n = \delta_i^o \cdot \zeta, \qquad i \in \mathcal{F}.$$

The restrictions $\phi_i = \phi$, $\zeta_i = \xi_i = \zeta$ could not be rejected for any season at the usual 5%-level. The p-values for testing the hypothesis $\phi = \zeta = 1$ are reported in table 3 in the column labeled ϕ, ζ. The estimates for ϕ and ζ are presented in the last two columns of table 3. In this specification, the expected number of goals scored by team i when it plays a home game against team j is $\alpha_i\beta_j$ under the old coach and $\phi\alpha_i\beta_j$ under the new coach. Therefore, there would be any firing effect, we would expect ϕ to exceed 1 (offensive capabilities improve). Similar reasoning leads us to believe that ζ is smaller than 1 (defensive capabilities improve). We see that the hypothesis of no firing effect is now rejected for two seasons: 1993/94 and 1997/98. In both cases, the rejection is caused by a significant improvement in the defensive capabilities of the teams that fired a coach: the expected number of goals conceded is reduced by 35% and 31% respectively. Note that these improvements in defensive skills correspond to a drop in the average number of goals conceded by 0.65 (1993/94) and 0.78 (1997/98) (see table 1). In the rating model discussed earlier, we also found that in these two seasons team quality improved significantly.

5 Conclusions

This paper examines if firing a coach and hiring a new one improves the performance of a team. We focus on soccer and in particular soccer in the Dutch Premier League. Our results illustrate tht it is not sufficient to simply compare goals scored, or some measure of goals scored under the old and new coach. This simple approach does not control for the differences in the quality of the opponents faced by the new and old coach.

Our methodology uses data from a five year period and controls for quality differences in opponents. We find that the performance of a team does not always improve when a coach is fired. In some cases, new coaches perform worse than their fired predecessors. This result is contrary to previous findings in the sports literature which indicate that firing a coach improves performance.

The model used in this paper allows us separate changes in performance to changes in defensive and offensive skills. By doing so, we find that there is some evidence that the defensive skills of the teams show improvement when a coach is fired and a new coach takes over. This may indicate however, that the new coach adopts a strategy to avoid losses rather than a more aggressive winning strategy.

Considering our empirical results, firing a coach occurs too often. Since it is not clear that the results on the field improve after a change of coach, it is likely that the board of a team intervenes for other reasons. It is likely that fan and media pressure are also strong determinants of the tenure of a coach.

It would be interesting to address the question whether a new coach is more successful if he is an outsider than if he is an insider. Unfortunately, our data do not allow us to address this issue, we leave this for future research.

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A Fired Coaches 1993/94 until 1997/98

A complete overview of coaches that were fired during the period we consider is given in table 4. In the first column we give the team, in the second column the coach that was fired, in the third column the reason for the firing, and in the fifth and sixth column the new coach and the date respectively. We distinguish between four different reasons for a termination of the contract between the coach and his team:

results The coach is fired because the results fall short of expectations.

offer The coach leaves because he has a better offer from another team.

relation The coach is fired because work relation between either the coach and the team or the coach and the board have become strained.

voluntary The coach leaves his job voluntarily.

When a coach is fired, a settlement has to be made between the team and the coach. Whenever is possible to reach such a settlement before the actual date of firing, the dismissal is listed as 'voluntary'.

Sometimes the vacancy is filled by an interim coach first. In that case both the interim coach and the new coach are listed, as for example in the case of Volendam (1993/94): Korbach was succeeded by the interim coach Steegman on 2 Nov 1993, and the interim coach was succeeded by the new head coach Rijsbergen on 27 Feb 1994.

Note that in 1995/96 the coach of Volendam was fired after the regular competition. The team played promotion/relegation games under the new coach. Since we focus on results during the regular competition only, we do not take this firing into account in the empirical results.

Team	Fired coach	Reason	New Coach	Date
1993/94				
FC Utrecht	Fafié	results	Van Veen	17 Sep 1993
Cambuur	De Jong	results	Korbach	2 Nov 1993
Volendam	Korbach	offer	Steegman	2 Nov 1993
			Rijsbergen	27 Feb 1994
RKC	Verel	results	Jacobs	16 Dec 1993
FC Groningen	Vonk	results	Koevermans	19 Mar 1994
1994/95				
PSV	De Mos	relation	Rijvers	29 Oct 1994
			Advocaat	15 Dec 1994
Go Ahead Eagles	Ten Cate	results	Fafié	30 Jan 1995
FC Utrecht	Van Veen	results	Vonk/	
			Du Chatinier	18 Feb 1995
Dordrecht '90	Van Zoghel	results	Verslijen	4 Mar 1995
Sparta	Berger	relation	Van Stee	21 Mar 1995
Willem II	Reker	relation	De Jong	26 Mar 1995
MVV	Vergoossen	voluntary	Reker	16 May 1995
1995/96				
Feyenoord	Van Hanegem	results	Meijer	2 Oct 1995
			Haan	16 Oct 1995
De Graafschap	Körver	relation	Korbach	31 Oct 1995
NEC	Van Kooten	results	Looyen	7 Nov 1995
			Koevermans	8 Dec 1995
Vitesse	Spelbos	results	Thijssen/	
			Jongbloed	20 Nov 1995
FC Twente	Ten Donkelaar	voluntary	Rutten	20 Nov 1995
			Meyer	15 Jan 1996
FC Utrecht	Kistemaker	results	De Ruiter	18 Dec 1995
			Spelbos	18 Jan 1996

Table 4: Fired coaches, source *Voetbal International* (1999)(continued).

Team	Fired coach	Reason	New Coach	Date
Willem II	De Jong	relation	Calderwood	19 Mar 1996
Go Ahead Eagles	Fafié	results	Maaskant/	
			Maaskant	16 Apr 1996
FC Volendam	Jacobs	results	Brouwer/	
			De Boer	6 May 1996
1996/97				
Roda JC	Stevens	offer	Achterberg	10 Oct 1996
			Jol	1 Nov 1996
RKC	Van Kooten	results	Verkerk	12 Oct 1996
			Jacobs	
Sparta	Ten Cate	offer	Brand	12 Jan 1997
			Roks/	
			Van Tiggelen	17 Apr 1997
Vitesse	Beenhakker	voluntary	Ten Cate	10 Jan 1997
FC Groningen	Westerhof	results	Van Dijk	25 Feb 1997
NEC	Koevermans	results	Looyen	3 Mar 1997
1997/98				
Fortuna S.	Verbeek	voluntary	Van Marwijk	3 Sep 1997
FC Utrecht	Spelbos	results	De Ruiter	27 Oct 1997
			Wotte	4 Jan 1998
Feyenoord	Haan	results	Meijer	28 Oct 1997
			Beenhakker	7 Nov 1997
Roda JC	Jol	results	Achterberg	6 Mar 1998
			Vonk	17 Mar 1998
FC Groningen	Rijsbergen	results	Van Dijk	31 Mar 1998

Table 4: Fired coaches, source *Voetbal International* (1999).

	θ_i^o	θ_i^n	$\bar{\theta}_i$	h_i^o	h_i^n	$\bar{h}_i$
1993/94						
Cambuur	−0.966	−0.933	-	−0.411	1.265	-
Groningen	−0.496	0.391	0.365	−0.540	0.885	0.895
RKC	−0.510	0.329	−0.074	−0.380	0.364	1.035
Utrecht	−1.369	−0.671	0.322	0.945	1.139	0.785
1994/95						
Dordrecht	−0.938	0.616	−0.624	0.458	0.246	0.062
Go Ahead Eagles	−1.639	0.192	−0.356	−0.540	0.885	0.573
MVV	−0.834	0.511	0.304	0.596	0.107	0.016
PSV	1.160	0.740	1.432	0.804	1.550	0.703
Sparta	−0.698	−1.525	−0.303	1.711	2.036	0.938
Utrecht	−0.902	0.722	0.131	1.361	−0.760	0.625
Willem II	0.253	−2.097	0.020	0.849	1.674	1.109

Table 5: Detailed results for the regression model (continued).

B Detailed Estimation Results

In this appendix we give detailed estimation results of the models in section 4. First, in table 5 we give the name of the teams that changed coaches, with the quality and home parameters of the old and new coaches. Moreover, we give the quality and home parameters of these teams based on estimation of the model for the four seasons previously. We will denote these 'long-term' parameters by a bar on top of the parameter.

	θ_i^o	θ_i^n	$\bar{\theta}_i$	h_i^o	h_i^n	$\bar{h}_i$
1995/96						
Feyenoord	−0.436	1.246	1.359	3.601	−0.013	0.040
Go Ahead Eagles	0.256	−1.452	−0.466	−1.235	−0.271	0.527
De Graafschap	−0.612	−1.564	−1.162	−0.051	2.578	1.519
NEC	−0.458	−0.246	−0.330	−0.881	−1.037	1.107
FC Twente	0.300	0.030	0.545	−0.632	0.078	0.697
Utrecht	−0.858	−0.208	−0.043	0.139	−0.273	0.525
Vitesse	0.219	0.842	0.855	0.542	−0.489	0.369
Willem II	0.616	−0.852	−0.267	0.311	−0.459	0.900
1996/97						
Groningen	−0.426	1.806	−0.155	−0.137	−1.760	0.437
NEC	−0.838	−1.346	−0.213	0.412	2.489	−0.103
RKC	0.247	−0.926	0.371	−0.928	0.961	−0.282
Vitesse	0.674	−0.799	0.785	−0.416	2.249	0.265
1997/98						
Feyenoord	−0.030	1.252		1.936	−0.168	
Fortuna Sittard	−2.130	0.863		−0.765	−0.227	
Groningen	−0.650	−0.885		0.934	1.521	
Roda JC	0.312	0.553		0.058	0.256	
Utrecht	−1.121	0.263		0.581	1.064	

Table 5: Detailed results for the regression model.