For What It's Worth: Outcome Bias in Managerial Decisions

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Abstract

Decisions informed by past events can be distorted when outcomes partially determined by chance are misinterpreted as purely skill-based. This can lead to outcome bias, where decisions are evaluated based on results rather than the quality of the performance that produced them. Outcome bias is prevalent across domains, including managerial decision-making. This paper investigates outcome bias in professional football, a highly competitive industry. The analysis is based on managers who were replaced within-season from 2017/18 to 2024/25 in the top divisions of the five main European football leagues. The main finding is that clubs tend to change managers in response to recent match results rather than underlying performance indicators. This behavior reflects an economically inefficient decision-making process driven by outcome bias.

Keywords: Outcome bias, professional football, bookmaker odds, manager replacement

JEL-codes: C20, L83, M12, Z20

Conflict of interest: None.

Availability of data and materials: The data supporting the findings of this study come from various public sources and will be made publicly available in a single dataset.

For what it's worth is a song written in 1966 by *Stephen Stills* and performed by *Buffalo Springfield*.

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1 Introduction

Decisions based on past events may be influenced by earlier outcomes that were, at least in part, determined by chance. When this randomness is overlooked, outcome bias can occur. Outcome bias arises when decisions are judged based on their outcomes rather than the quality of the decision-making process itself. Early studies on outcome bias focused on the evaluation of past decisions. The central issue was that such evaluations were sometimes biased because outcomes that followed the decision influenced the judgment. Since these evaluations occur after the fact, the evaluator often has access to information—such as the outcome—that was not available to the original decision-maker (Baron and Hershey (1988)).

Outcome bias has been observed across a variety of contexts, including managerial decision-making. Sports data offer a rich context for economic analysis. As argued by Kocher and Sutter (2010), the presence of explicit randomization, well-defined rules, and abundant high-quality data make sports particularly suitable for empirical research. Moreover, as Balafoutas et al. (2019) noted, sports allow for direct observation of behavior under high-stakes conditions, further enhancing their value for studying decision-making. Unsurprisingly, some of the few observational studies on outcome bias have used sports data. Lefgren et al. (2015), for example, found that NBA-coaches were more likely to change a line-up after a loss than after a win, even if the loss was small and therefore did not contain information about the performance of a team. Meier et al. (2023) replicated the results from Lefgren et al. (2015) finding evidence of outcome bias in the top women's professional basketball league, college basketball and the US National Football League (NFL).

The current paper investigates outcome bias in managerial decision-making using observational data from a real-world, highly competitive industry: professional football.[1] The focus is on the top divisions of the five major European football leagues: English Premier League, French League 1, German Bundesliga, Italian Serie A and Spanish La Liga over the seasons 2017/18 to 2024/25.

The four main findings of the analysis are the following. First, replacement of a manager after a particular match was more likely if the results in previous matches from the start of the season were disappointing. Second, the quality of recent match performances were not important. Third, bad results in recent matches had a positive effect on manager replacement. In combination these findings suggest that decisions on manager replacement are outcome biased. A fourth finding in line with outcome bias is

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[1] In a companion paper outcome bias in consumer demand for football stadium attendance is investigated (Van Ours, 2025).

that the consequences of manager replacement are equivalent to a regression to the mean phenomenon. Overperforming managers were less likely to be replaced but if they were replaced match results did not improve. Underperforming managers were more likely to be replaced and if they were, match results improved. Neither of the two consequences are causally related to the manager replacement. The same events would have occurred if the managers had not been replaced. In fact, the disappointments that led to the replacement of the managers did not improve at all. On average, by the end of the season the results were as disappointing as they were when the managers were replaced.

The remainder of the paper is structured as follows. Section 2 discusses potential determinants and consequences of manager replacements. Section 3 describes the data used in the analysis. Section 4 presents the results of the empirical analysis. Section 5 concludes.

2 Managerial Replacements in Professional Football

2.1 Determinants

Whether decisions are based on outcomes and thus open to bias or whether decisions are based on a combination of outcomes and other information avoiding a bias is an empirical matter. In addition to measures of long term performance many previous studies found that recent match outcomes affected the replacement of managers in professional football. Examples are Audas et al. (1999) and d'Addona and Kind (2014) for English football, De Dios Tena and Forrest (2007) for Spanish football, Salomo et al. (2000), Frick et al. (2010), and Pieper et al. (2014) for German football and Van Ours and van Tuijl (2016) for Dutch football. Based on an analysis for eight leagues in France, Germany, Italy and Spain, Bryson et al. (2021) found that the likelihood that a football manager was replaced was significantly lower when the team was performing above expectations. Flepp and Franck (2021) using expected goals as a measure of the quality of performance found that sometimes managers were replaced after a series of bad luck. Finally, Jedelhauser et al. (2025) analyzed outcome bias in the five main European leagues over five seasons finding that dismissals of managers were more likely to occur after bad luck. This indicates that outcome bias played a role in the decisions to dismiss a manager.

2.2 Consequences

The position of managers in professional football resembles the position of top managers in business. The main difference is that the performance of managers is measured more

precisely and frequently while the ownership structure is simpler and the business is more transparent. There is clear evidence of managers affecting performance. Muehlheusser et al. (2018), for example, found for German football that managers from the top of the ability distribution gained on average considerably more points than managers from the bottom. They also found evidence of managers affecting teams' playing style. Peeters and van Ours (2025) found that more productive managers work in more productive clubs. More productive managers were more likely to move to a higher productivity club within countries as well as between countries.

Nevertheless, there is doubt whether a within-season replacement of a manager will be effective. The main conclusion of many studies such as Arnulf et al. (2012) for Norway, Balduck et al. (2010) for Belgium, De Paola and Scoppa (2012) for Italy, Madum (2016) for Denmark, Van Ours and van Tuijl (2016) for the Netherlands, Besters et al. (2016) for England and Bryson et al. (2024) for eight leagues in France, Germany, Italy and Spain is the same: A within-season football manager replacement on average does not have an effect on team performance. An exception to this is Muehlheusser et al. (2016) who found evidence that replacing a manager increased performance of heterogeneous teams. In such teams, players have a stronger incentive to exert effort to convince the new manager of their abilities than in teams that are homogeneous in ability. Flepp and Franck (2021) studying the effects of football manager replacements in five European top leagues over five seasons found that after a series of bad luck, performance increased by reverting to the mean irrespective of whether or not a manager has been replaced.

3 Data

The empirical analysis of the determinants and consequences of managerial replacements is based on information from the top divisions of the five main European football leagues. The period of analysis is determined by the availability of information on expected goals: 2017/18 - 2024/25 (see Appendix A for details).

3.1 Measuring success and disappointment

Bookmaker odds can be used to calculate expected match outcomes. With decimal odds, the probability that home team i wins against away team j is equal to: $Prob_{ij}^h = (1/O_{ij}^h)/(1/O_{ij}^h + 1/O_{ij}^d + 1/O_{ij}^a)$ in which O_{ij}^h are the odds for a home win, O_{ij}^d are the odds for a draw and O_{ij}^a are the odds for an away win. The probability of a draw is derived in a similar way. The bookmaker-expected points for the home team are equal to $B_{ij}^h = Prob_{ij}^h * 3 + Prob_{ij}^d$. The bookmaker based expected points are ex ante, i.e.,

they are expected before the match start. The actual points P_{ij}^h the home team obtains from a match depends the match outcome: three points for a win, one for a draw. The difference between the actual number of points and the expected number of points based on bookmaker odds represents the match surprise. To study manager replacement the cumulative surprise as it evolves over the season may be important. The cumulative surprise for club i in season s after n matches is equal to: $CS_{isn} = \sum_{k=1}^n (P_{isk} - B_{isk})$.

3.2 Measuring performance

Football is a low-scoring sport in which outcomes are significantly affected by random events. As such, actual match results may not accurately reflect team performance. Expected goals (xG) are considered more reliable indicators of underlying performance. An expected goal is a metric that represents the estimated probability that a shot (or a header) on target would have resulted in a goal occurred. The probability that a shot results in a goal is calculated through the analysis of thousands of shots and is related to the location of the shooter (distance and angle to the goal), the body part, the type of pass and the type of attack. The expected goals do not take into account the quality of players involved in a particular play. It is an estimate of how an average player or team would perform in a similar situation. Brechot and Flepp (2020) argued that shots on goal contain informational value even if they do not result in goals showing that recent expected goals are better predictors of future performance than recent actual goals (see Mead et al. (2023) and Roccetti et al. (2024) for similar conclusions).

Expected points based on expected goals are an indication of the quality of performance. They are calculated ex post, i.e. after a match has concluded. Expected goals are first transferred into a probability distribution of a discrete number of goals. Then, comparing goals scored and conceded the distribution of the number of expected points is calculated (see for a similar approach Partida et al. (2021)). Assuming that there is a Poisson distribution, P_s, of the number of goals scored k it holds that $P_s(k; xG_s) = \frac{(xG_s)^k e^{-xG_s}}{k!}$, where xG_s is the expected number of goals scored. The same holds for the distribution of the goals conceded: $P_c(k; xG_c) = \frac{(xG_c)^k e^{-xG_c}}{k!}$, where xG_c is the expected number of goals conceded. Then, the probability of a match ending in a draw: $P^{\text{draw}} = \sum_{k=0}^{N_{max}} P_s(k; xG_s) P_c(k; xG_c)$, whereby N_{max} is the maximum number of goals scored (and conceded). The probability of a win is equal to $P^{\text{win}} = \sum_{k=0}^{N_{max}} (P_s(k; xG_s) \sum_{m=0}^{k-1} P_c(m; xG_c))$. Then, the expected number of points is equal to: $xP = 3 \times P^{\text{win}} + P^{\text{draw}}$.

4 Empirical Analysis of Manager Replacements

4.1 Determinants

The rate by which managers are replaced at club i after match t ($t > 3$) in season s conditional on observed performance characteristics x and unobserved characteristics v is assumed to have a mixed proportional hazard (MPH) specification: $\theta_{ist}(t \mid x, v) = \lambda(t) \exp(h(x_{ist}) + v)$, where the observed performance characteristics are Cumulative Surplus (CS), expected points (xP) and actual points (P) such that

$$h(x_{ist}) = \beta CS_{ist} + \gamma_1 \sum_{t-3}^{t-1} xP_{ist} + \gamma_2 \sum_{t-3}^{t-1} P_{ist} \tag{1}$$

The parameter γ_1 indicates the effect on the manager replacement rate of the quality of the performance in the previous three matches. The parameter γ_2 indicates the effects of the number of points obtained in the previous three matches. There is no outcome bias if $\gamma_2 = 0$. Furthermore, $\lambda(t)$ represents duration dependence which is modeled using a step function: $\lambda(t) = \exp(\Sigma_k \lambda_k I(t))$ where k ($= 1,..,4$) is a subscript for duration intervals and $I(t)$ are time-varying dummy variables that are one in subsequent duration intervals. The exact specification of the duration intervals depends on the particular league. For England, Italy and Spain the intervals are 10, 10, 10 and 8 weeks; for Germany and France this is 9, 9, 9 and 8 weeks. Because a constant term is also included, λ_1 is normalized to 0.

The conditional density function of the completed durations until manager replacement can be written as

$$f(t \mid x, v) = \theta(t \mid x, v) \exp\left(-\int_0^t \theta(s \mid x, v) ds\right) \tag{2}$$

It may be that there are unobserved club characteristics that affect the manager replacement rates. The density function of observed durations until manager replacement can be specified as

$$f(t \mid x) = \int_v f(t \mid x, v) dG(v) \tag{3}$$

where the $G(v)$ is assumed to be a discrete distribution with two points of support (v_1, v_2). The specification of the distribution of unobserved heterogeneity implies that conditional on the observed match performance characteristics there are two types of clubs, one with a high replacement rate, the other with a low replacement rate. The associated

probabilities are denoted as $\Pr(v = v_1) = p, \Pr(v = v_2) = (1 - p)$ where p is assumed to have a logit specification: $p = \frac{\exp(\alpha)}{1+\exp(\alpha)}$ and v_1 is normalized to zero.

Table 1: **Baseline Parameter Estimates Mixed Proportional Hazard Rate Models Manager Replacement**

	England		France		Germany		Italy		Spain	
Cum Surprise (β)	-0.33	(0.06)***	-0.41	(0.07)***	-0.49	(0.06)***	-0.37	(0.06)***	-0.43	(0.06)***
xP previous 3 (γ_1)	-0.10	(0.15)	-0.21	(0.15)	-0.28	(0.14)*	-0.03	(0.13)	-0.13	(0.13)
P previous 3 (γ_2)	-0.37	(0.11)***	-0.20	(0.09)*	-0.24	(0.09)**	-0.40	(0.09)***	-0.31	(0.10)**
Duration dependence										
λ_2	0.96	(0.40)*	2.36	(0.56)***	1.14	(0.46)*	0.24	(0.37)	0.48	(0.36)
λ_3	1.64	(0.50)***	2.26	(0.74)**	1.57	(0.52)**	0.06	(0.42)	0.79	(0.44)
λ_4	0.60	(0.76)	0.58	(1.02)	1.81	(0.58)***	-1.20	(0.73)	0.66	(0.53)
Unobs. heterogeneity										
v_2	-4.00	(0.68)***	-3.43	(0.67)***	-4.06	(0.53)***	$-\infty$		-4.29	(1.01)***
α	-0.19	(0.30)	-0.86	(0.39)*	0.36	(0.33)	2.38	(0.94)*	0.96	(0.40)*
$\Pr(v = v_1)$	0.45		0.30		0.59		0.92		0.72	
-Loglikelihood	230.0		181.1		196.4		234.9		235.0	
Club-seasons	160		136		144		160		160	

Note: xPoints and Points previous three matches parameters multiplied by 10. Standard errors in parentheses. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 1 shows the parameter estimates of the MPH model. In every league, the cumulative surprises have significant negative effects on the probabilities of manager replacements. If disappointment grows over the season, managers are more likely to be replaced. In terms of magnitude the effect is largest in Germany and smallest in England. The number of expected points in the previous three matches also have negative effects on manager replacement but this is only significant (at 5%) in the German league. The absence of an effect in the other four leagues is no surprise as presumably bookmakers took recent quality of performance into account when setting their odds. So, the effect of recent quality of performance is included in the cumulative surprise. In every league the effect of the number of points in the previous three matches is significantly negative. This is evidence of outcome bias in decision making about manager replacement.

The other parameter estimates in Table 1 show that there is some duration dependence in the manager replacement rates with the lowest rates in the early part of the seasons. The other patterns in duration dependence are league-specific. In England and France there is no significant effect (compared to the first part of the season) in the last part of the season. In Germany, the duration dependence is positive over the season while in Italy and Spain there is not much of duration dependence. In every league there is also unobserved heterogeneity indicating that some clubs are not very likely to replace their manager irrespective of the circumstances. In the Italian league there is a small group of 8% that has a zero probability of replacing a manager (Appendix C shows that the results are very similar if recent match results are calculated over the previous four matches).

4.2 Consequences

The effects of replacing a manager can be investigated by comparing match outcomes after and before the replacement.

$$P_{it} = \alpha_{it} + \delta I(t_i > t_i^r) + \varepsilon_{it} \tag{4}$$

where P is the number of points per match (0,1,3) for club i, α represent club-season fixed effects, t^r is the first match after manager replacement, $I(t > t^r)$ is an indicator for matches after manager replacement, δ is the parameter of main interest and ε is the error term. Table 2 presents the relevant parameter estimates where a distinction is made between managers who were replaced after overperforming and managers who were underperforming in the previous three matches. In line with the previous finding that good recent match outcomes lower the manager replacement rate there are only a few observations of manager replacement after overperforming.

Table 2: **Effects of Manager Replacement (Points per Match)**

	England		France		Germany		Italy		Spain	
Effect replacement (δ)										
Overperforming	-0.03	(0.16)	0.18	(0.15)	0.37	(0.17)*	0.05	(0.20)	0.28	(0.14)
Underperforming	0.32	(0.07)***	0.24	(0.07)***	0.42	(0.07)***	0.35	(0.06)***	0.36	(0.06)***
Manager replacements										
Overperforming	8		9		8		5		11	
Underperforming	44		34		43		55		47	
Observations										
Overperforming	304		338		272		190		418	
Underperforming	1672		1256		1462		2090		1786	

Note: All estimates contain club-season fixed effects.
Overperforming (underperforming): Last three matches: $P > xP$ ($P \leq xP$).
Standard errors in parentheses. * $p < .05$, ** $p < .01$, *** $p < .001$.

Clearly, if managers were overperforming there is most often no effect on the match results, with the German league being a exception. If managers were underperforming there are positive and significant effects in all leagues. After replacing their manager clubs obtained 0.24 (France) to 0.42 (Germany) extra points per match.

Table 3 shows that for every league the cumulative surprises at the time of manager replacements were significantly negative. This was still the case at the end the end of the season. The differences between the cumulative surprises in matches of clubs that had a (first) manager replacements at the time of replacement and the cumulative surprises at the end of the season are not significant in any of the leagues. This shows that replacing a manager did not remove the cumulative disappointment. The clubs who replaced their manager were as worse off at the end of the season as they were when replacing their manager. For the clubs without manager replacement the cumulative surprises were on

average significantly positive while the overall averages were never significantly different from zero (Appendix D shows the distributions of the cumulative surprises at different points in time during the season).

Table 3: **Cumulative Surprises Over a Season**

	England		France		Germany		Italy		Spain	
At manager replacement	-4.19	(0.50)***	-3.92	(0.55)***	-5.19	(0.48)***	-4.25	(0.40)***	-4.54	(0.37)***
End of season - replacement	-4.19	(0.94)***	-4.09	(0.95)***	-4.27	(0.74)***	-4.21	(0.83)***	-4.82	(0.80)***
Δ	0.00	(1.06)	-0.17	(1.11)	0.92	(0.89)	0.04	(0.92)	-0.28	(0.88)
Δ - Overperforming	-4.74	(2.00)*	0.14	(1.43)	1.93	(2.06)	-1.26	(2.76)	-0.09	(1.97)
Δ - Underperforming	0.87	(0.84)	-0.26	(0.98)	0.76	(0.62)	0.15	(0.73)	-0.32	(0.74)
End of season - no replacement	2.26	(0.63)***	1.93	(0.63)***	2.02	(0.63)***	2.25	(0.56)***	2.49	(0.64)***
End of season - overall	0.16	(0.57)	0.03	(0.58)	-0.25	(0.55)	-0.17	(0.53)	-0.16	(0.57)
Manager replacements	52		43		51		60		58	
Overperforming	8		9		8		5		11	
Underperforming	44		34		43		55		47	
Club-seasons	160		136		144		160		160	

Note: Overperforming (underperforming): Last three matches: $P > xP$ ($P \leq xP$). Standard errors in parentheses. * $p < .05$, ** $p < .01$, *** $p < .001$.

5   Conclusions

In a competitive environment with efficient markets in economic decision-making all information should be taken into account. If randomness in past outcomes is not accounted for outcome bias may occur. The current paper presents an analysis of managerial decisions in professional football, focusing on potential outcome biases.

The analysis is based on manager replacements in up to eight seasons in the top divisions of the five main European professional football leagues. The main finding of the empirical analysis is that an outcome bias is present when football clubs decided about whether or not to replace their manager. This decision is influenced by poor performance as measured by cumulative disappointment from the start of the season when comparing actual match outcomes with expectations based on bookmaker odds. Poor recent match results had a positive effect on manager replacement. In itself this is not evidence of outcome bias. It could be that poor results were caused by poor performance. However, there is outcome bias if good performance led to poor results because of bad luck and this bad luck led to manager replacement. This is indeed what happened.

An intriguing question is why club managements suffered from inefficient decision making caused by outcome bias. The straightforward answer is that it may not be in their best interest to also take information about expected goals into account when judging the performance of their manager. They have stakeholders to deal with and these stakeholders do not have the same ideas about using expected goals to determine the underlying

quality of past performance. Supporters and media of all sorts may only use actual match outcomes to establish their idea of the quality of performance ignoring randomness in goal scoring. The outcome bias of football clubs in their decisions about replacing managers may be related to the well-known prisoner's dilemma in which replacing a manager is the dominating strategy irrespective of whether match results improve. If after replacing a manager match results improve all stakeholders will think the management took a wise decision. If after replacement results do not improve they have at least given it try. If after not replacing a manager match results deteriorate then all stakeholders will think that the management took a bad decision. They should have replaced the manager. If after not replacing a manager results improve that will go largely unnoticed. It is true that match results can improve if a manager is replaced but in many situations this is not the risk the club management is willing to take. This study shows that in fact in the situation of an underperforming manager replacement was unnecessary as results would have improved anyway.

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Appendix A: Details on Data

In the analysis data are used from the following sources: Goals, match outcomes and bookmaker odds: football-data.co.uk; Expected goals: fbref.com; Replacement of managers: Wikipedia.

Table A.1 provides descriptives of the main variables in the analysis defined as averages per match which are very similar across the leagues. The average number of points per (home) match is about 1.5 to 1.6. This also holds for bookmaker points and expected points implying that on average points, bookmaker points and expected points go hand in hand.

Table A.1: **Descriptives Top Five European Leagues**

	England	France	Germany	Italy	Spain
Points per match	1.57	1.55	1.55	1.50	1.63
Bpoints per match	1.56	1.57	1.57	1.54	1.60
Surprise points per match	0.01	-0.02	-0.02	-0.04	0.03
xPoints per match	1.54	1.54	1.55	1.50	1.59
Points previous 3 matches	4.70	4.57	4.67	4.53	4.83
XPoints previous 3 matches	4.61	4.61	4.66	4.51	4.75
Observations	2800	2305	2228	2795	2800

Note: The first three matches in every season for each club are ignored. Surprise is equal to the difference between Points and Bookmaker points. England, Italy and Spain 20 teams per season; Germany 18 teams per season; France up to 2023/24 20 teams and after that 18 teams. Season 2019/20 excluded for France since due to Covid-restrictions this season was terminated prematurely.

Table A.2 summarizes the managerial replacements in the five leagues over the period of analysis (Appendix B provides details of all manager replacements). Manager replacements before the third match in a season are ignored since there is no full information about performance in the previous three matches. If a club replaced more than one manager in a season the analysis is based on the first manager who was replaced.

Table A.2: **Manager Replacements Top Five European Football Leagues**

	England	France	Germany	Italy	Spain
2017/18	9	6	7	9	9
2018/19	5	6	6	8	8
2019/20	5	–	7	10	7
2020/21	4	8	8	6	6
2021/22	9	4	4	5	9
2022/23	11	9	8	7	8
2023/24	3	5	6	8	7
2024/25	6	5	5	7	4
Total	52	43	51	60	58

Appendix B: Managerial Changes

Tables B.1 to B.5 show for every season which manager replacements are taken into account in the analysis. Manager replacements are ignored if they occur before the third match in a season or after three matches before the end of the season. If a club replaced more than one manager in a season the analysis is based on the first manager who was replaced. The tables also indicate after how many matches a manager was replaced.

Table B.1: **England - Premier League; 52 Replacements**

Season	Club	Manager	After
2017-18	Crystal Palace	Frank de Boer	4
	Leicester	Craig Shakespeare	8
	Everton	Ronald Koeman	9
	West Ham	Slaven Bilić	11
	West Brom	Tony Pulis	12
	Swansea	Paul Clement	18
	Stoke	Mark Hughes	22
	Watford	Marco Silva	24
	Southampton	Mauricio Pellegrino	30
2018-19	Fulham	Slaviša Jokanović	12
	Southampton	Mark Hughes	14
	Man United	José Mourinho	17
	Huddersfield Town	David Wagner	22
	Leicester	Claude Puel	27
2019-20	Tottenham	Mauricio Pochettino	12
	Arsenal	Unai Elmery	13
	Watford	Quique Sánchez Flores	14
	Everton	Marco Silva	15
	West Ham	Manuel Pellegrini	19
2020-21	West Brom	Slaven Bilić	12
	Chelsea	Frank Lampard	19
	Sheffield	Chris Wilder	27
	Tottenham	José Mourinho	32
2021-22	Watford	Xisco Muñoz	7
	Newcastle	Steve Bruce	8
	Tottenham	Nuno Espirito Santo	10
	Norwich	Daniel Farke	11
	Aston Villa	Dean Smith	11
	Man United	Ole Gunnar Solksjær	12
	Everton	Rafael Benítez	22
	Leeds United	Marcelo Bielsa	27
	Burnley	Sean Dyche	32
2022-23	Bournemouth	Scot Parker	4
	Chelsea	Thomas Tuchel	6
	Brighton	Graham Potter	6
	Wolves	Bruno Lage	9
	Aston Villa	Steven Gerrard	12
	Southampton	Ralph Hasenhüttl	15
	Everton	Frank Lampard	21
	Leeds	Jesse Marsch	22
	Crystal Palace	Patrick Vieira	27
	Tottenham	Antonio Conte	28
	Leicester	Brendan Rodgers	29
2023-24	Sheffield	Paul Heckingbottom	14
	Nottingham Forrest	Steve Cooper	17
	Crystal Palace	Roy Hodgson	25
2024-25	Man United	Erik ten Hag	9
	Leicester	Steve Cooper	12
	Wolverhampton	Gary O'Neill	16
	Southampton	Russell Martin	16
	West Ham	Julien Lopetegui	20
	Everton	Sean Dyche	20

Table B.2: **France - Ligue 1; 43 Replacements**

Season	Club	Manager	After
2017-18	Metz	Philippe Hinschberger	10
	Rennes	Christian Gourcuff	12
	Saint-Étienne	Óscar García	12
	Lille	Barcelo Bielsa	17
	Bordeaux	Jocelyn Gourvennec	21
	Toulouse	Pascal Dupraz	22
2018-19	Nantes	Miquel Cardoso	8
	Monaco	Leonardo Jardim	9
	Guingamp	Antoine Kombouaré	12
	Rennes	Sabri Lamouchi	15
	Dijon	Olivier Dall'Oglio	19
	Bordeaux	Ricardo Gomes	26
2019-20	Excluded from the analysis		
2020-21	Metz	Vincent Hognon	6
	Dijon	Stéphane Jobard	9
	Nice	Patrick Vieria	12
	Nantes	Christian Gourcuff	13
	Paris Saint-Germain	Thomas Tuchel	17
	Marseille	André Villas-Boas	22
	Nîmes	Jérôme Arpinon	23
	Rennes	Julien Stéphan	27
2021-22	Saint-Étienne	Claude Puel	17
	Troyes	Laurent Batlles	19
	Monaco	Niko Kovač	19
	Bordeaux	Vladimir Petkovic	23
2022-23	Lyon	Peter Bosz	10
	Auxerre	Jean-Marc Furlan	10
	Brest	Michel Der Zakarian	10
	Reims	Óscar García	10
	Montpellier	Olivier Dall'Oglio	11
	Troyes	Bruno Irles	14
	Angers	Gérald Baticle	15
	Strasbourg	Julie Stépahn	17
	Nice	Lucien Favre	17
2023-24	Marseille	Mercelino	5
	Rennes	Bruno Génésio	12
	Nantes	Gperre Aristouy	13
	Lyon	Fabio Grosso	13
	Reims	Will Still	31
2024-25	Montpellier	Michel Der Zakarian	8
	Rennes	Julien Stéphan	10
	Saint Étienne	Olivier Dall 'Oglio	15
	Lyon	Pierre Sage	19
	Reims	Luka Elsner	20

Note: Season 2019-20 excluded from the analysis because due to Covid-restrictions the season ended prematurely.

Table B.3: **Germany - Bundesliga; 51 Replacements**

Season	Club	Manager	After
2017-18	Bayern Munich	Carlo Ancelotti	6
	Werder Bremen	Alexander Nouri	10
	1. FC Köln	Peter Stöger	14
	Borussia Dortmund	Peter Bosz	15
	Hamburger SV	Markus Gisdol	19
	VfB Stuttgart	Hannes Wolf	20
	Vfl Wolfsburg	Martin Schmidt	23
2018-19	VfB Stuttgart	Tayfun Korkut	7
	Bayer Leverkusen	Heiko Herrlich	17
	Hannover 96	André Breitenreiter	23
	1. FC Nürnberg	Michael Köllner	25
	Schalke 04	Domenico Tedesco	25
	FC Augsburg	Manuel Baum	28
2019-20	Bayern Munich	Niko Kovač	10
	1. FC Köln	Achim Beierlorzer	11
	Mainz 05	Sandro Schwarz	11
	Hertha BSC	Ante Čović	12
	Fortuna Düsseldorf	Friedhelm Funkel	19
	FC Augsburg	Martin Schmidt	25
	1899 Hoffenheim	Alfred Schreuder	30
2020-21	Borussia Dortmund	Lucien Favre	11
	Schalke 04	Manuel Baum	12
	Mainz 05	Jan-Moritz Lichte	13
	Hertha BSC	Bruno Labbadia	18
	Arminia Bielefeld	Uwe Neuhaus	23
	Bayer Leverkusen	Peter Bosz	26
	1. FC Köln	Markus Gisdol	28
	Augsburg	Heiko Herrlich	30
2021-22	Vfl Wolfsburg	Mark van Bommel	9
	Hertha BSC	Pál Dárdai	13
	RB Leipzig	Jesse Marsch	14
	Arminia Bielefeld	Frank Kramer	30
2022-23	RB Leipzig	Domenico Tedesco	5
	VfL Bochum	Thomas Reis	6
	Bayer Leverkusen	Gerardo Seoane	8
	VfB Stuttgart	Pellegrino Matarazzo	9
	Schalke 04	Frank Kramer	10
	1899 Hoffenheim	André Breitenreiter	19
	Bayern Munich	Julian Nagelsmann	25
	Hertha BSC	Sando Schwarz	28
2023-24	FC Augsburg	Enrico Maassen	7
	Mainz 05	Bo Svensoon	9
	Union Berlin	Urs Fischer	11
	1. FC Köln	Steffen Baumgart	16
	Vfl Wolfsburg	Niko Kovač	26
	VfL Bochum	Thomas Letsch	28
2024-25	Bochum	Peter Zeidler	7
	Hoffenheim	Pellegrino Matarazzo	10
	Union Berlin	Bo Svensson	15
	Borussia Dortmund	Nuri Sahin	18
	Leipzig	Marco Rose	27

Table B.4: **Italy - Serie A; 60 Replacements**

Season	Club	Manager	After
2017-18	Cagliari	Massimo Rastelli	8
	Benevento	Marco Baroni	9
	Genoa	Ivan Jurić	12
	Udinese	Luigi Delneri	13
	Sassuolo	Cristian Bucchi	14
	Milan	Vincenzo Montella	14
	Crotone	Davide Nicola	15
	Torino	Sinisa Mihajlović	19
	Chievo	Rolando Marin	35
2018-19	Chievo	Lorenzo D'Anna	8
	Genoa	Davide Ballardini	8
	Empoli	Aurelio Andreazzoli	11
	Udinese	Julio Velázquez	12
	Frosinone	Moreno Longo	16
	Bologna	Filippo Inazghi	21
	Roma	Eusebio Di Francesco	26
	Fiorentina	Stefano Pioli	31
2019-20	Sampdoria	Eusebio Di Francesco	7
	Milan	Marco Giampaolo	7
	Genoa	Aurelio Andreazzoli	8
	Udinese	Igor Tudor	10
	Brescia	Eugenio Corini	11
	Napoli	Carlo Ancelotti	15
	Fiorentina	Vincenzo Montella	17
	Torino	Walter Mazzarri	22
	SPAL	Leonardo Semplici	23
	Cagliari	Rolando Maran	26
2020-21	Fiorentina	Giuseppe Iachini	7
	Genoa	Rolando Maran	13
	Parma	Fabio Liverani	16
	Torino	Marco Giampaolo	18
	Cagliari	Eusebio Di Francesco	23
	Crotone	Giovanni Stroppa	24
2021-22	Salernitana	Fabrizio Castori	8
	Genoa	Davide Ballardini	12
	Udinese	Luca Gotti	16
	Sampdoria	Roberto D'Aversa	22
	Venezia	Paolo Zanetti	34
2022-23	Bologna	Sinisa Mihajlovìc	5
	Monza	Giovanni Stroppa	6
	Sampdoria	Marco Giampaolo	8
	Hellas Verona	Gabriele Cioffi	9
	Cremonese	Massimiliano Alvini	18
	Salernitana	Davide Nicola	22
	Spezia	Luca Gotti	22
2023-24	Salernitana	Paulo Sousa	8
	Udinese	Andrea Sottil	9
	Napoli	Rudi Garcia	12
	Empoli	Aurelio Andreazzoli	20
	Roma	José Mourinho	20
	Sassuolo	Alessio Dionisi	26
	Lecce	Roberto D'Aversa	28
	Lazio	Maurizio Sarri	28
2024-25	Lecce	Luca Gotti	12
	Roma	Ivan Juric	12
	Genoa	Alberto Gilardino	12
	Monza	Alessandro Nesta	17
	Milan	Paulo Fonseca	18
	Parma	Fabio Pecchia	25
	Juventus	Thiago Mott	29

Table B.5: **Spain - La Liga; 58 Replacements**

Season	Club	Manager	After
2017-18	Villarreal	Fran Escribá	6
	Las Palmas	Manolo Márquez	6
	Deportivo La Coruna	Pepe Mel	9
	Alaves	Giovanni De Biasi	13
	Sevilla	Eduardo Berizzo	17
	Malaga	Michel	19
	Levante	Juan Muñiz	27
	Real Sociedad	Eusebio Sacristán	29
	Espanyol	Quique Sánchez Flores	33
2018-19	Huesca	Leo Franco	8
	Real Madrid	Julen Lepetequi	10
	Celta Vigo	Antonio Mohamed	12
	Athletic Bilbao	Eduardo Berizzo	14
	Villarreal	Javier Calleja	15
	Real Sociedad	Asier Gaitano	17
	Sevilla	Pablo Machin	27
	Rayo Vallecano	Michel	27
2019-20	Espanyol	David Gallego	8
	Leganés	Mauricio Pellegrino	9
	Celta Vigo	Fran Escribá	12
	Barcelona	Ernesto Valverde	19
	Real Betis	Rubi	30
	Valencia	Albert Celades	32
	Alavés	Asier Gaitano	34
2020-21	Celta Vigo	Óscar Garcia	9
	Athletic Bilbao	Gaizka Garitano	17
	Huesca	Michel	18
	Alavés	Pablo Machin	18
	Elche	Jorge Almirón	23
	Valencia	Javi Gracia	34
2021-22	Levante	Paco López	8
	Getafe	Michel	8
	Barcelona	Ronald Koeman	11
	Elche	Fran Escribá	14
	Alavés	Javier Calleja	18
	Cádiz	Álvaro Cervera	20
	Granada	Robert Moreno	27
	Mallorca	Luis Garcia	29
	Espanyol	Vicente Moreno	36
2022-23	Elche	Franciso	7
	Sevilla	Julen Lepetequi	7
	Villarreal	Unai Emery	11
	Celta Vigo	Eduardo Coudet	12
	Valencia	Gennaro Gattuso	19
	Valladolid	Pacheta	27
	Espanyol	Diego Martinez	27
	Getafe	Quique Sánchez Flores	31
2023-24	Almería	Vicente Moreno	7
	Sevilla	José Luis Mendilibar	9
	Villarreal	Pacheta	12
	Granada	Paco López	14
	Cádiz	Sergio González	21
	Rayo Vallecano	Francisco	24
	Celta Vigo	Rafael Benitez	28
2024-25	Las Palmas	Garciá Pimienta	9
	Vallodolid	Paulo Pezzolano	11
	Alavés	Luis Garcia	15
	Valencia	Rubén Baraja	18

Appendix C: Additional Parameter Estimates

Table C.1 shows the parameter estimates using average xPoints and Points in the last four matches. The parameter estimates are very similar to those presented in Table 1 in the main text where the averages were calculate over the last three matches. The difference is that in Table C.1 for every league the effect of recent performance in terms of expected points is insignificantly different from zero.

Table C.1: **Parameter Estimates Mixed Proportional Hazard Rate Models –
Sensitivity Analysis**

	England		France		Germany		Italy		Spain	
Cum Surprise (β)	-0.35	(0.07)***	-0.46	(0.06)***	-0.46	(0.06)***	-0.36	(0.05)***	-0.39	(0.06)***
xP previous 4 (γ_1)	-0.07	(0.12)	-0.21	(0.12)	-0.10	(0.11)	-0.09	(0.12)	0.03	(0.11)
P previous 4 (γ_2)	-0.22	(0.10)*	-0.18	(0.09)*	-0.24	(0.09)**	-0.31	(0.08)***	-0.41	(0.08)***
Duration dependence										
λ_2	0.79	(0.40)*	2.79	(0.53)***	0.99	(0.43)*	0.17	(0.36)	0.45	(0.35)
λ_3	1.50	(0.50)***	2.31	(0.73)**	1.07	(0.48)*	-0.02	(0.40)	0.58	(0.45)
λ_4	0.76	(0.78)	0.47	(1.37)	1.21	(0.66)	-1.10	(0.76)	0.49	(0.53)
Unobs. heterogeneity										
v_2	-4.08	(0.66)***	-4.41	(0.56)***	-3.66	(0.60)***	$-\infty$		-3.88	(0.94)***
α	-0.23	(0.29)	-0.93	(0.29)***	0.52	(0.35)	2.54	(1.04)*	1.21	(0.48)*
$\Pr(v = v_1)$ (%)	44		28		63		93		77	
-Loglikelihood	231.6		179.1		198.3		232.5		227.2	
Club-seasons	160		136		142		158		160	

Note: xPoints and Points previous four matches parameters multiplied by 10. Standard errors in parentheses. * $p < .05$, ** $p < .01$, *** $p < .001$.

Appendix D: Distributions Cumulative Surprises

Figure D.1 shows the distributions of the cumulative surprise at the time of manager replacement and at the end of the season over all matches for the clubs of which the manager was not replaced. Clearly, managers were replaced when the results are disappointing, i.e. when cumulative surprises were negative. Figure D.1 also compares the distribution of the cumulative surprise at the time of manager replacement and at the end of the season a manager was replaced. If replacing a manager would have had positive effects of performance one would expect the cumulative surprises at the end of the season to have increased. This does not seem to have been the case. The distribution of the cumulative surprise at the end of the season is wider but not shifted to the right (see also Table 3 in the main text).
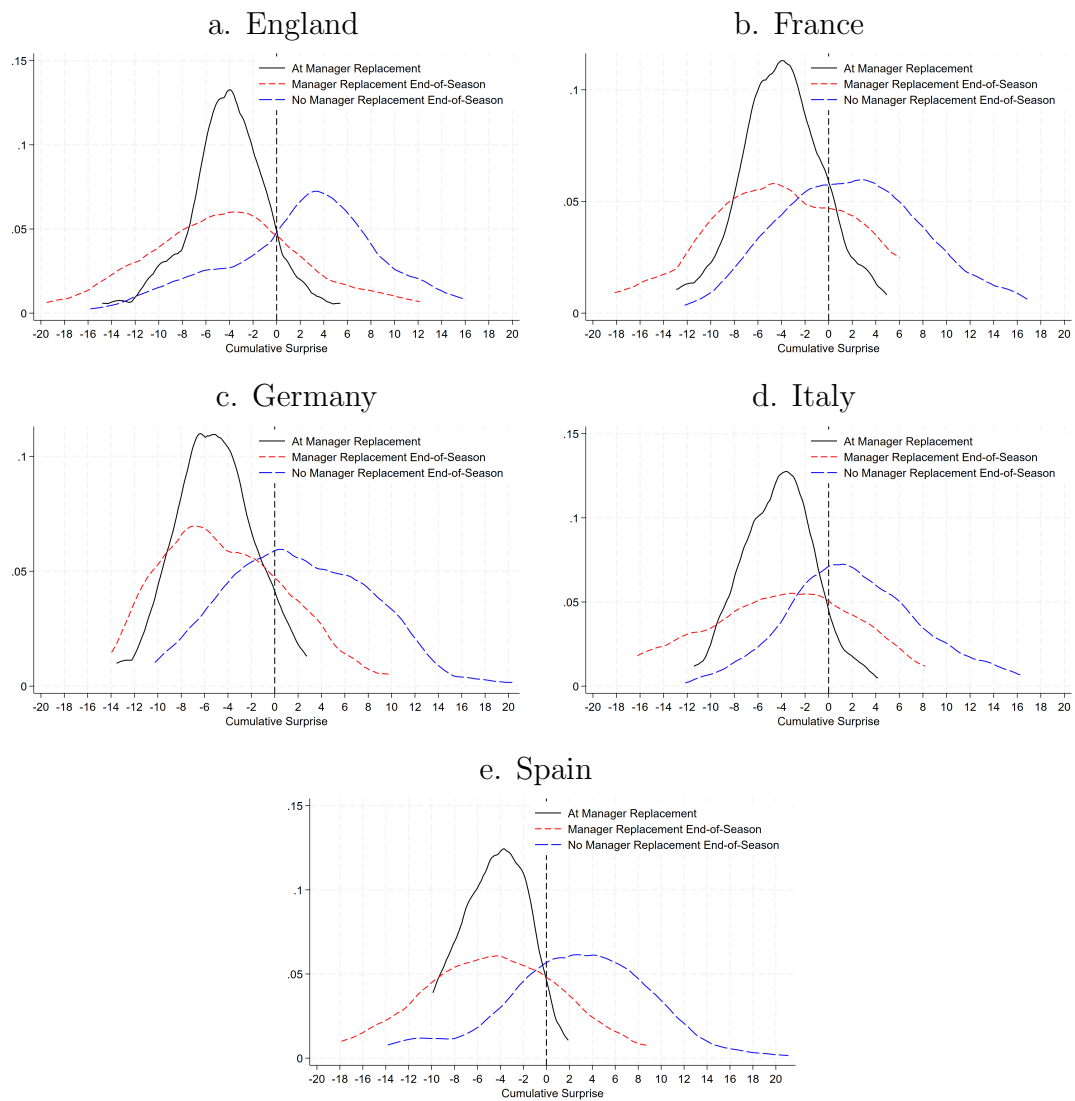
a. England

b. France

c. Germany

d. Italy

e. Spain

Figure D.1: **Distributions Cumulative Surprises at Manager Replacement and End-of-season With and Without Manager Replacement**